Committee on Technology -- TECHCO - 41

Host Country Presentation: „Steel Industry in Germany“

May 12 2009, Duesseldorf/Germany

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Steel Institute VDEh

TECHCO-41 – Host Country Presentation

Steel Industry in Germany –

- – at a glance
- – innovative and competitive
- – sustainable and efficiently
- – creative for sustainable products

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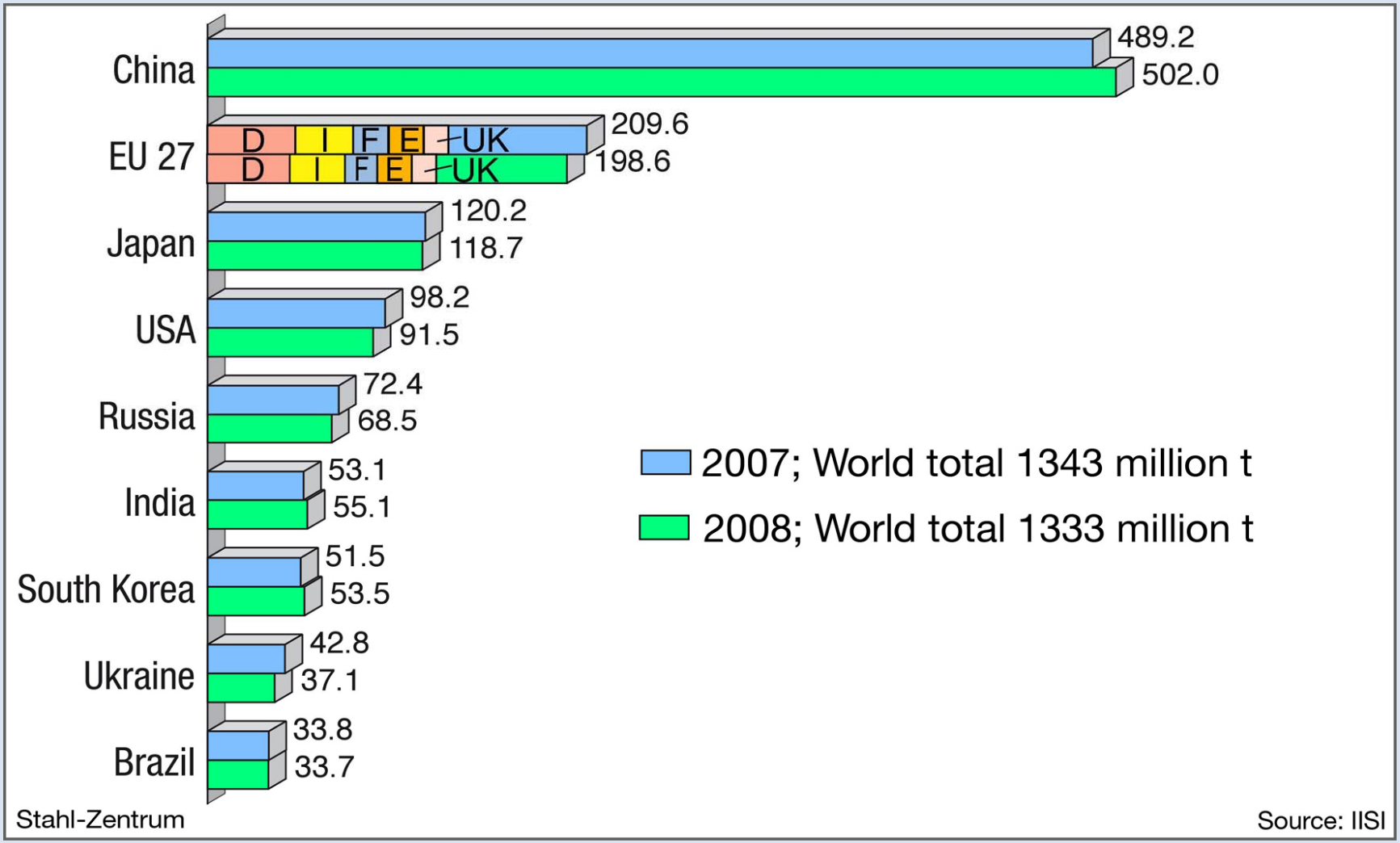
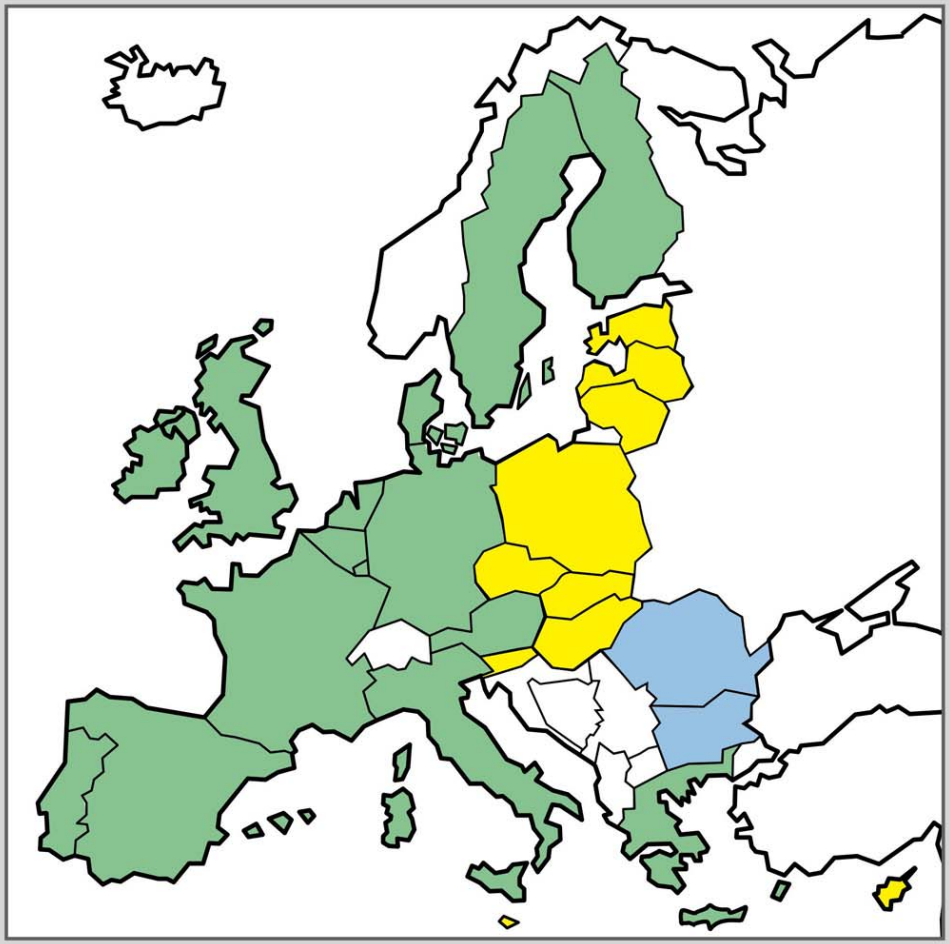
World crude steel production 2007 and 2008



The European Union with 27 Member States is a very Important Market



EU 15
387 million inhabitants
168 million t crude steel (2008)
434 kg steel per capita

+

May 1st, 2004
10 new member states
74 million inhabitants
24 million t crude steel (2008)
324 kg steel per capita

+

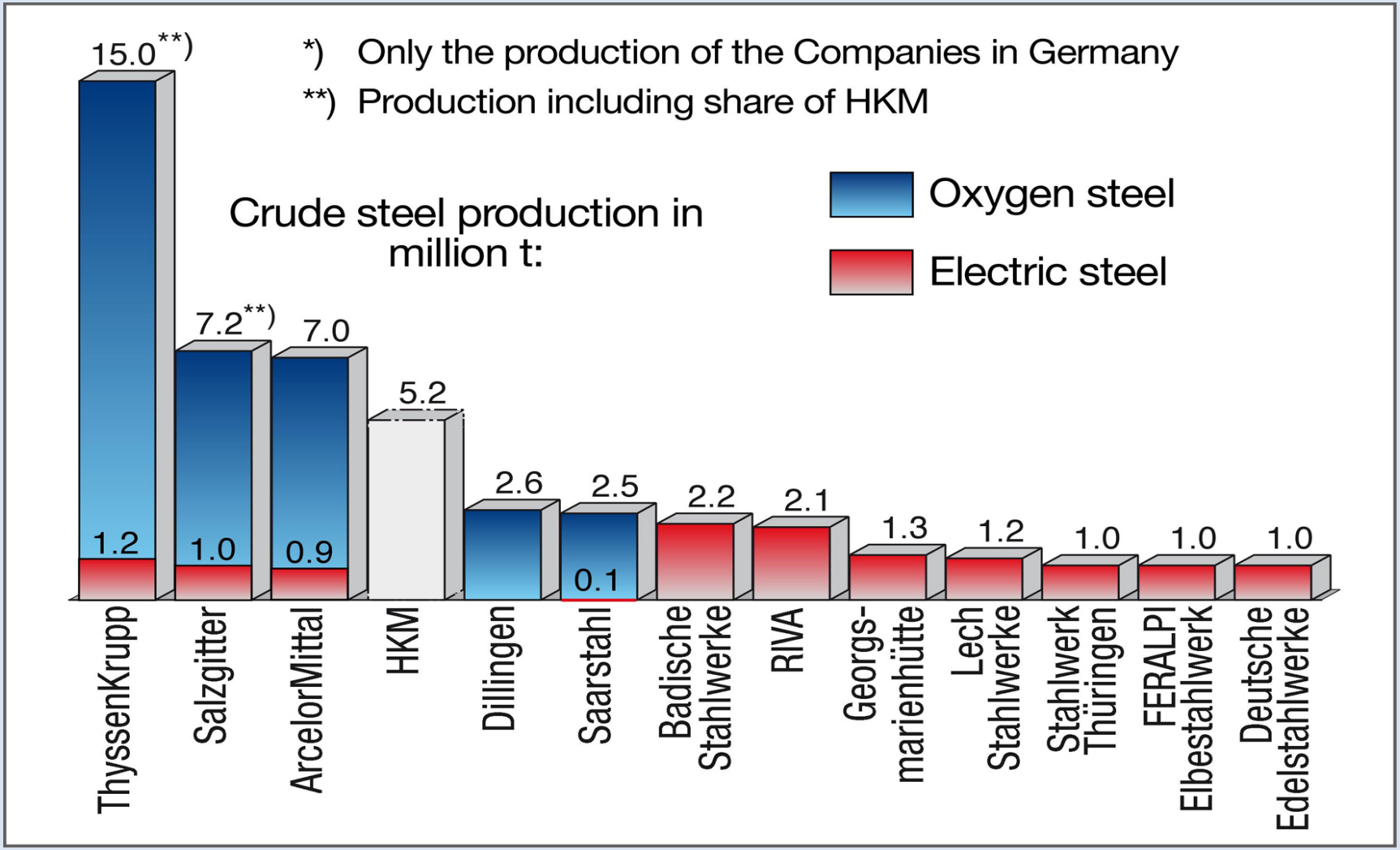
January 1st, 2007
2 new member states
29 million inhabitants
6 million t crude steel (2008)
207 kg steel per capita

=

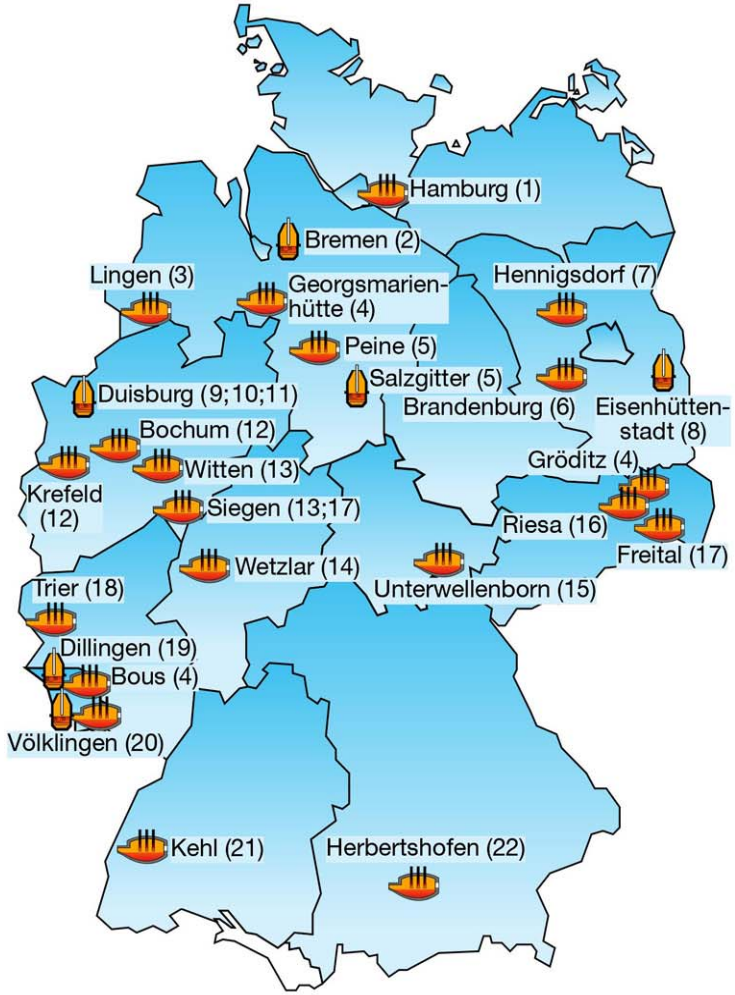
EU 27
490 million inhabitants
198 million t crude steel (2008)
404 kg steel per capita

Source inhabitants: CIA World Factbook
Source production: IISI, Crude Steel Production Outlook

The Largest Steel Producers in Germany 2008



The Steel Production Sites in Germany



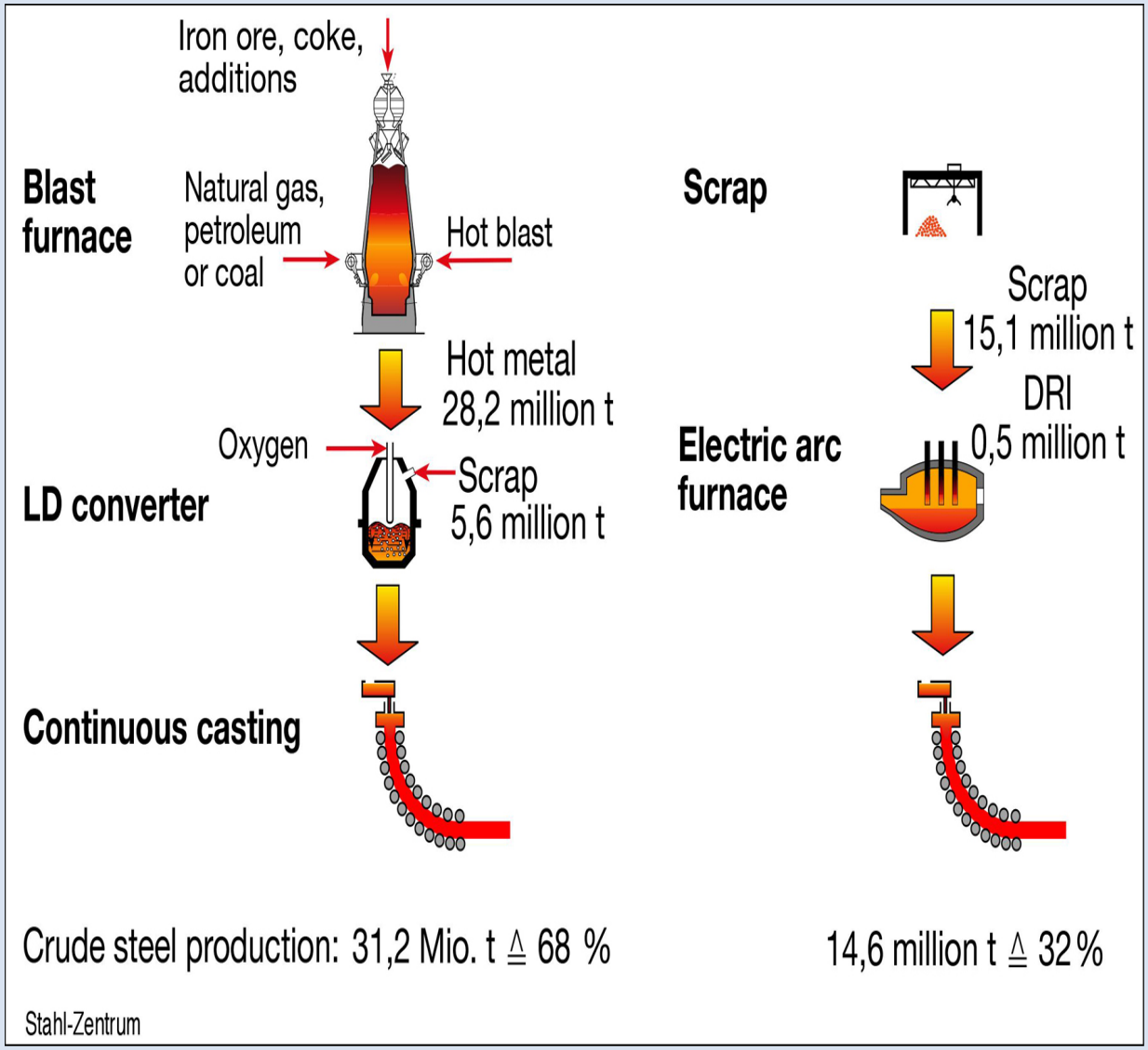
Crude steel production 2008 — Status: January 2009

Group/company	million t	Group/company	million t
(1) ArcelorMittal Hamburg	0.9	(11) ArcelorMittal Ruhrort	1.3
(2) ArcelorMittal Bremen	2.7	(12) ThyssenKrupp Nirosta	1.1
(3) Benteler	0.6	(13) Deutsche Edelstahlwerke	1.0
(4) Georgsmarienhütte Holding	1.3	(14) Edelstahlwerke Buderus	0.5
(5) Salzgitter	5.3	(15) Stahlwerk Thüringen	1.0
(6) Brandenburger Elektrostahlwerke	1.2	(16) ESF Elbe-Stahlwerk Feralpi	1.0
(7) Hennigsdorfer Elektrostahlwerke	0.9	(17) BGH Edelstahl	0.3
(8) ArcelorMittal Eisenhüttenstadt	2.1	(18) Trierer Stahlwerk	0.4
(9) ThyssenKrupp Steel	10.5	(19) Dillinger Hüttenwerke	2.6
(10) HKM	5.2	(20) Saarstahl	2.5
		(21) Badische Stahlwerke	2.2
		(22) Lech-Stahlwerke	1.2

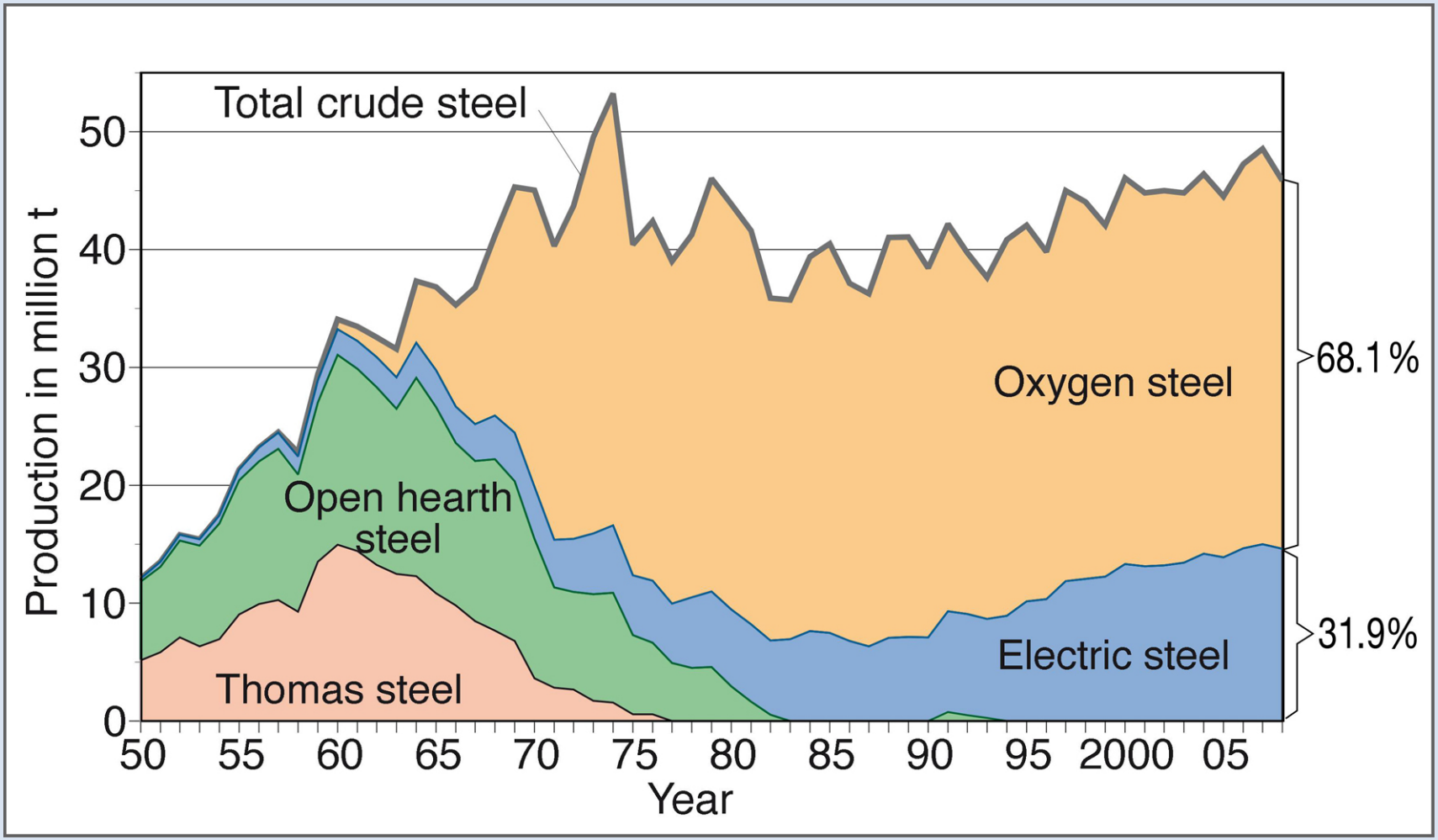
Electric steel works and rolling mills

Integrated iron and steel works
(Blast furnace, steel works and rolling mill)

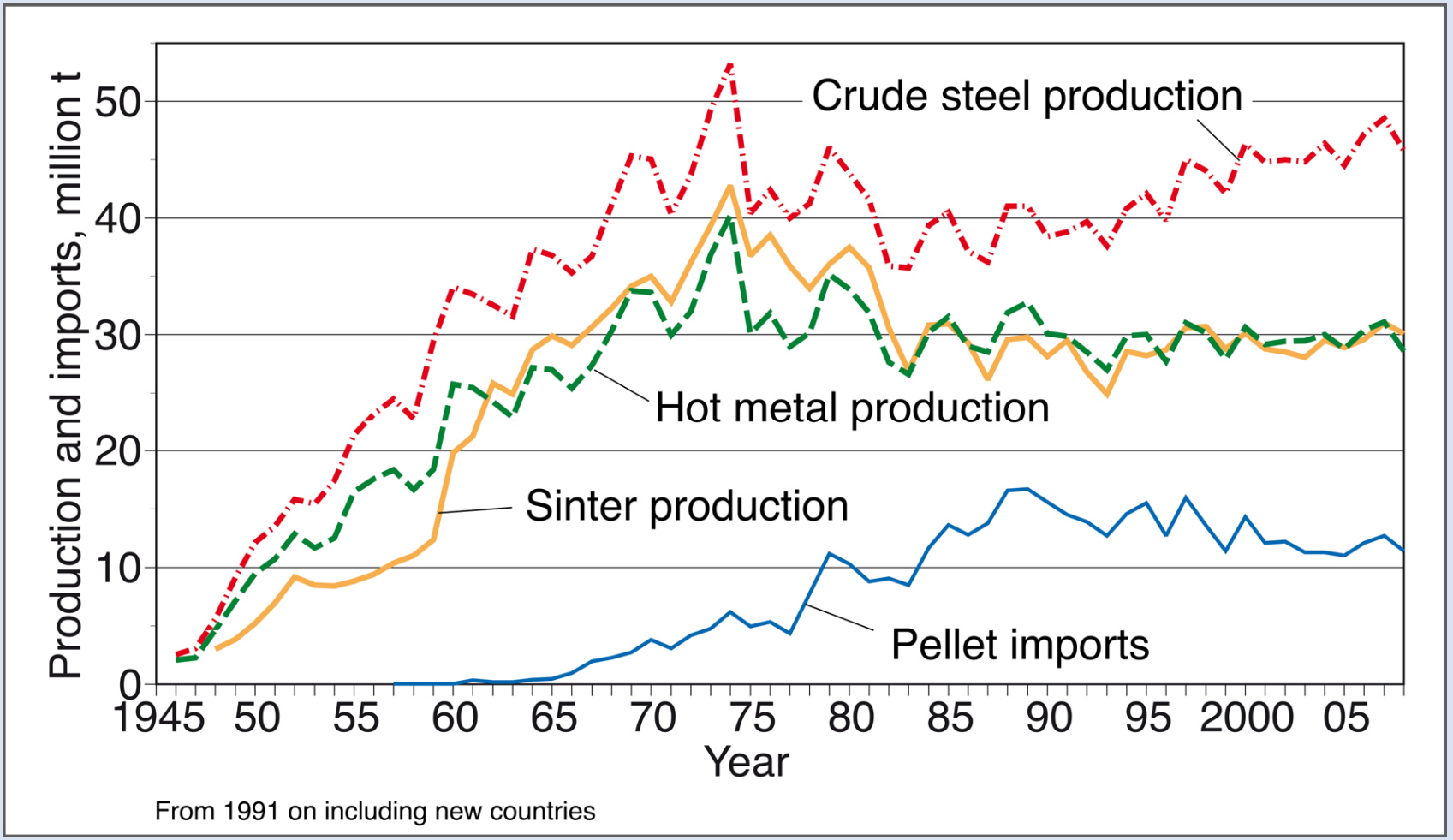
Production Routes for Steel Making in Germany 2008



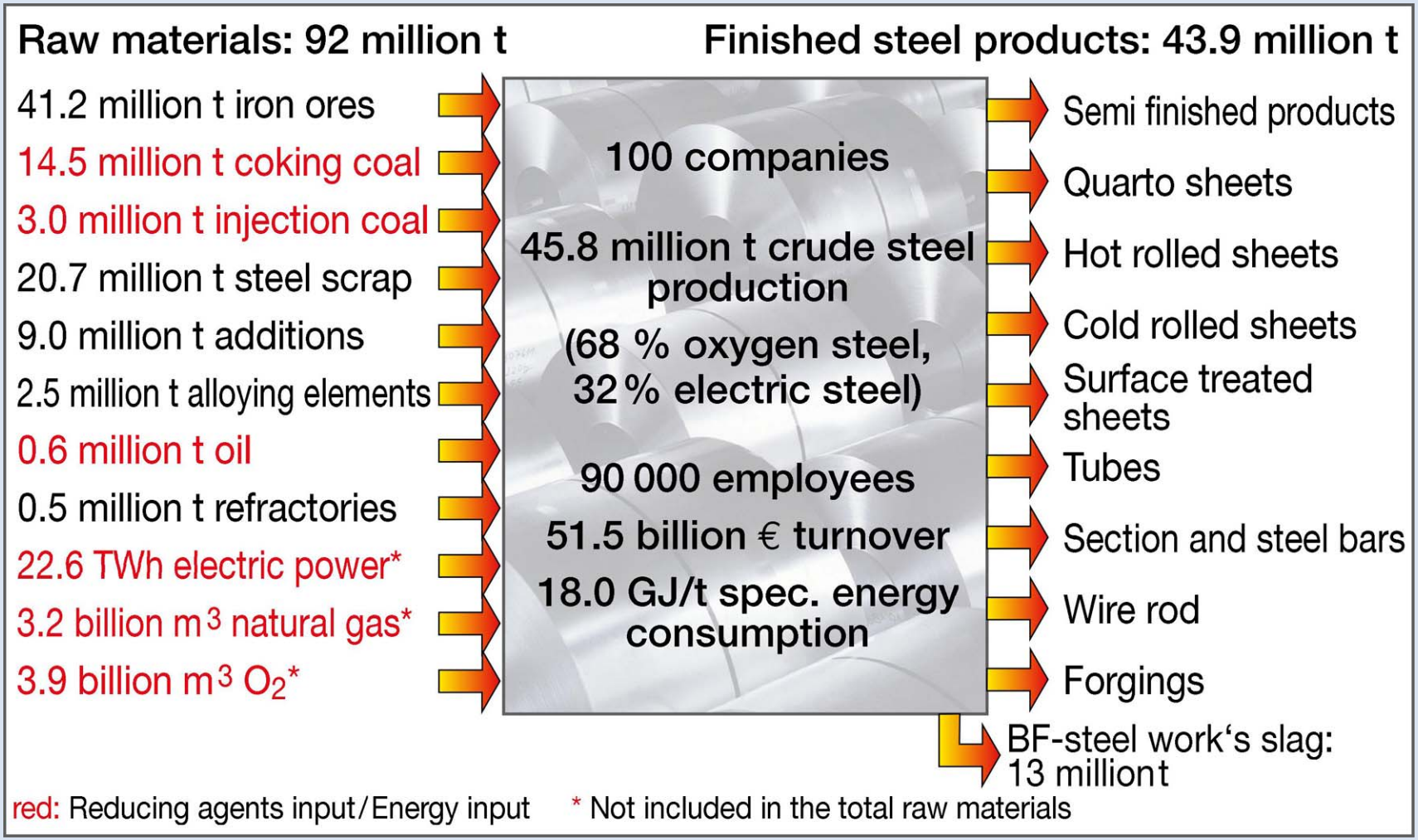
Crude Steel Production in Germany by Process



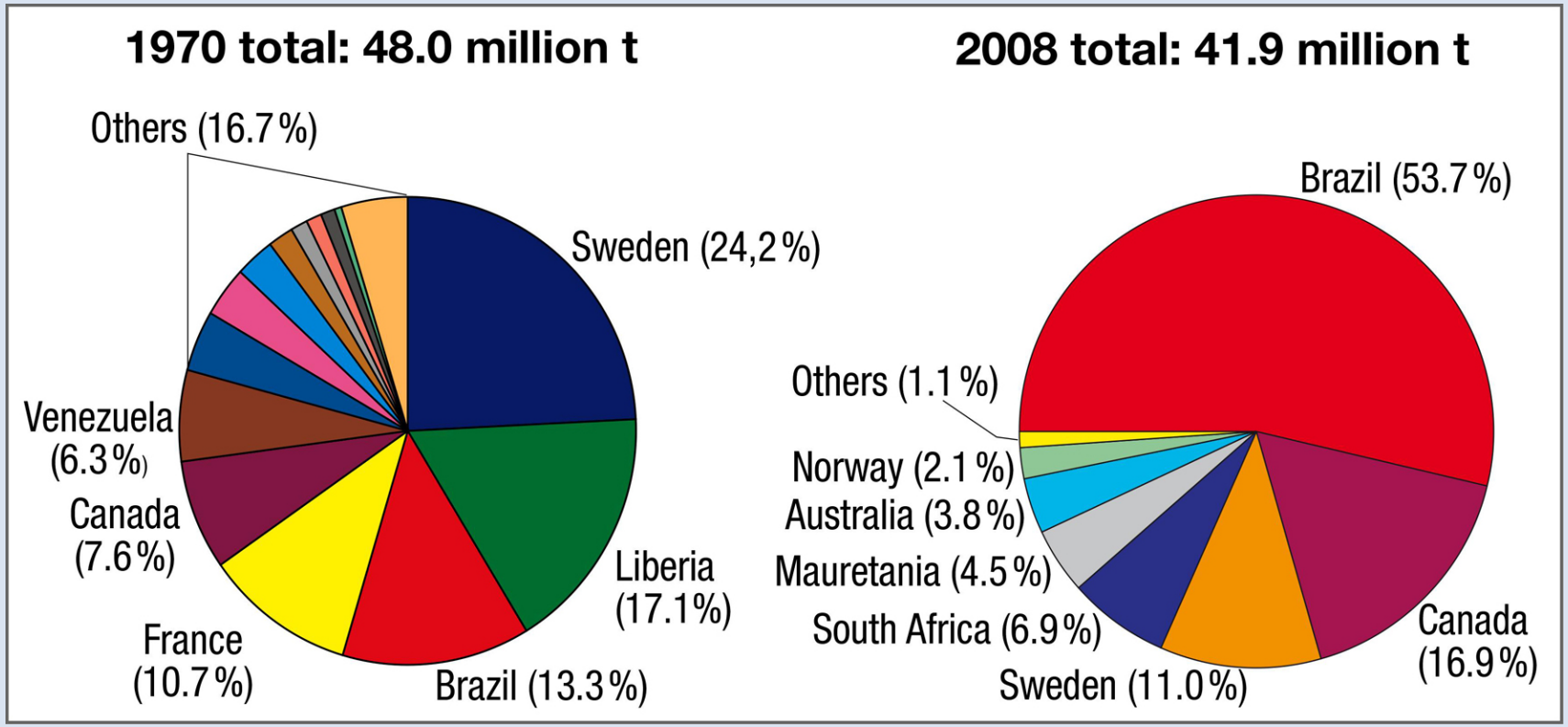
Production of Sinter, Hot Metal, Crude Steel and Pellet Imports of Germany 2008



Steel Industry in Germany 2008



Iron ore Imports of the German Steel Industry by Countries 1970/2008



Iron ore transportation and transfer

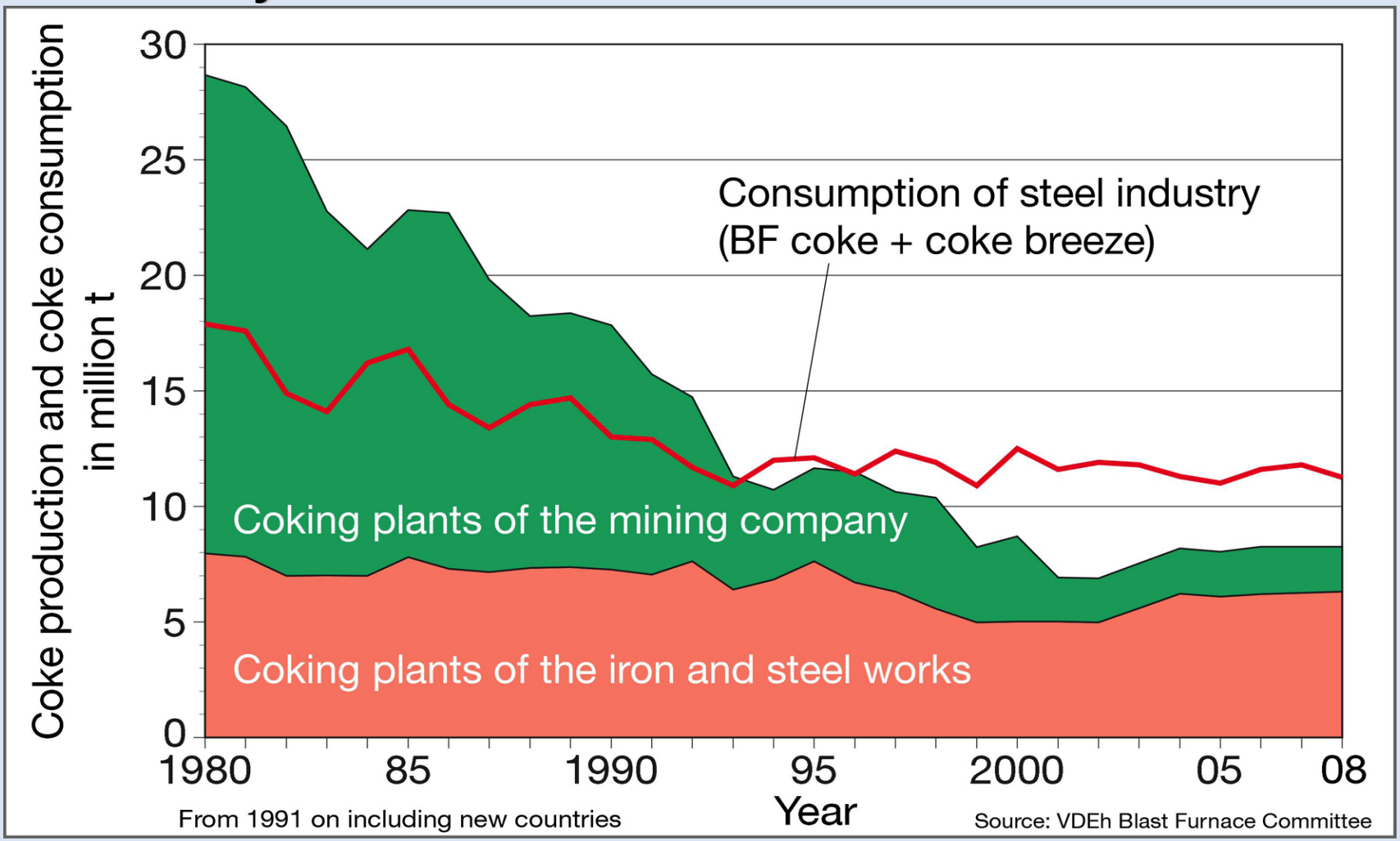
mv Berge Stahl
World‘s largest bulk carrier

Maximum cargo
in shuttle from Brazil to Rotterdam 365,000 t
Transport capacity
in 11 trips ~ 4.0 mill. t/y

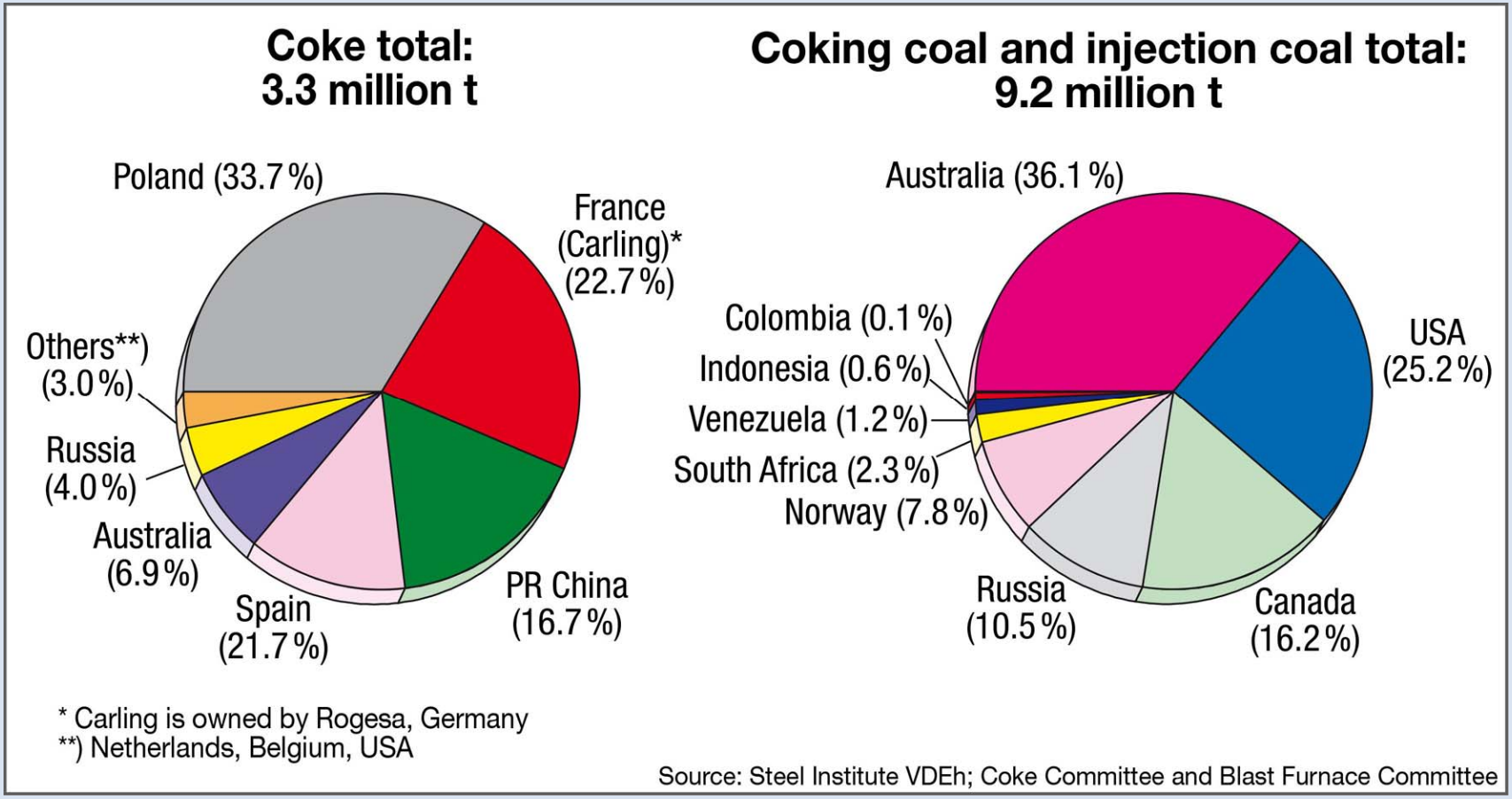
Ertsoverslagsbedrijf Europoort C.V. (EECV)
Port in Rotterdam

Ownership	TKS 75 %, HKM 25%
Maximum capacity	Sea-side unloading 27.5 mill. t Inland-side loading 27.0 mill. t

Coke Production and Consumption by the Steel Industry in Germany



Imports of Coal and Coke of German Steel Industry by Countries in 2008

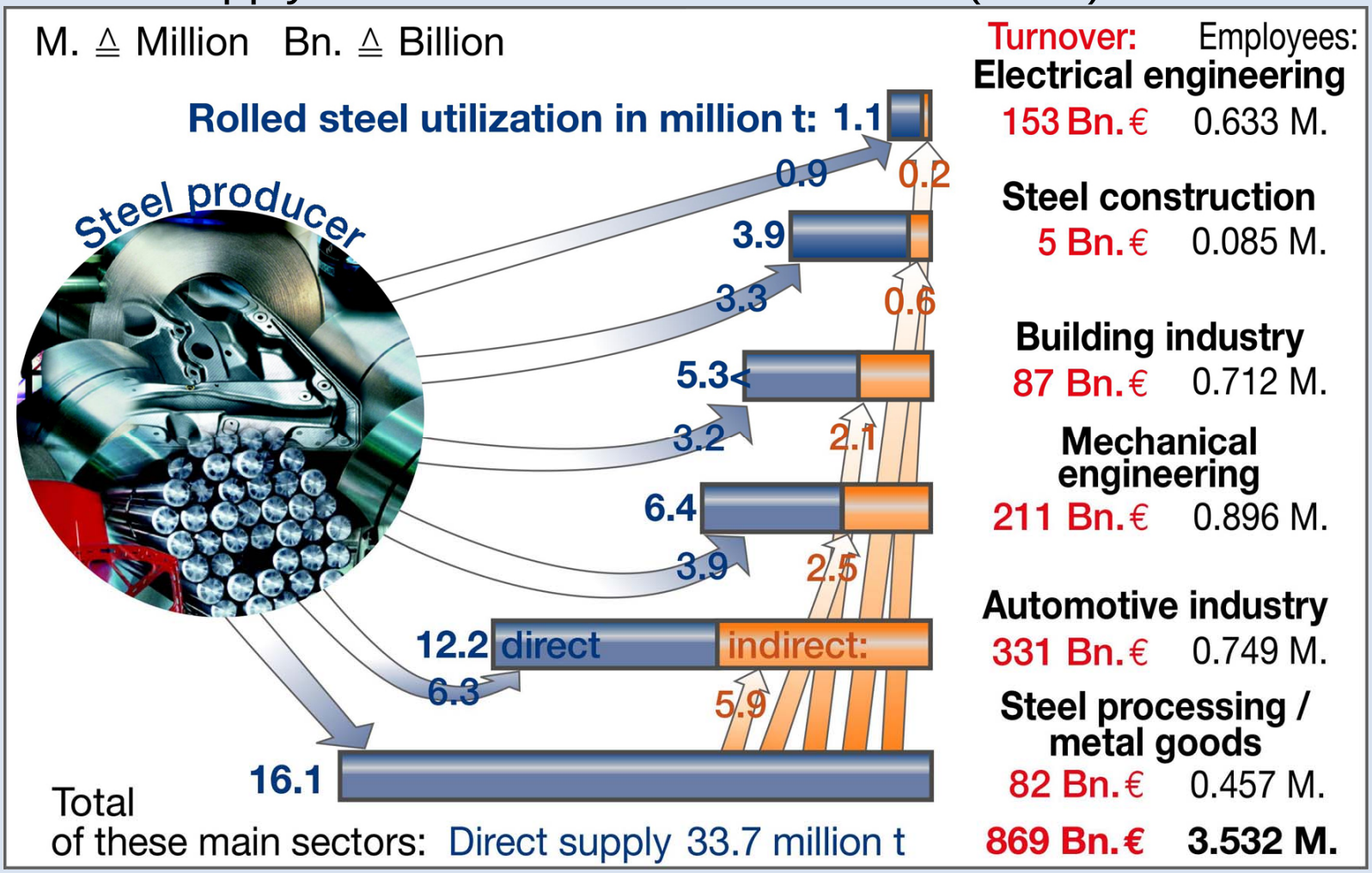


Location of the Coke Oven Plants in Germany

Coke plant, Schwelgern, Commissioned 2003

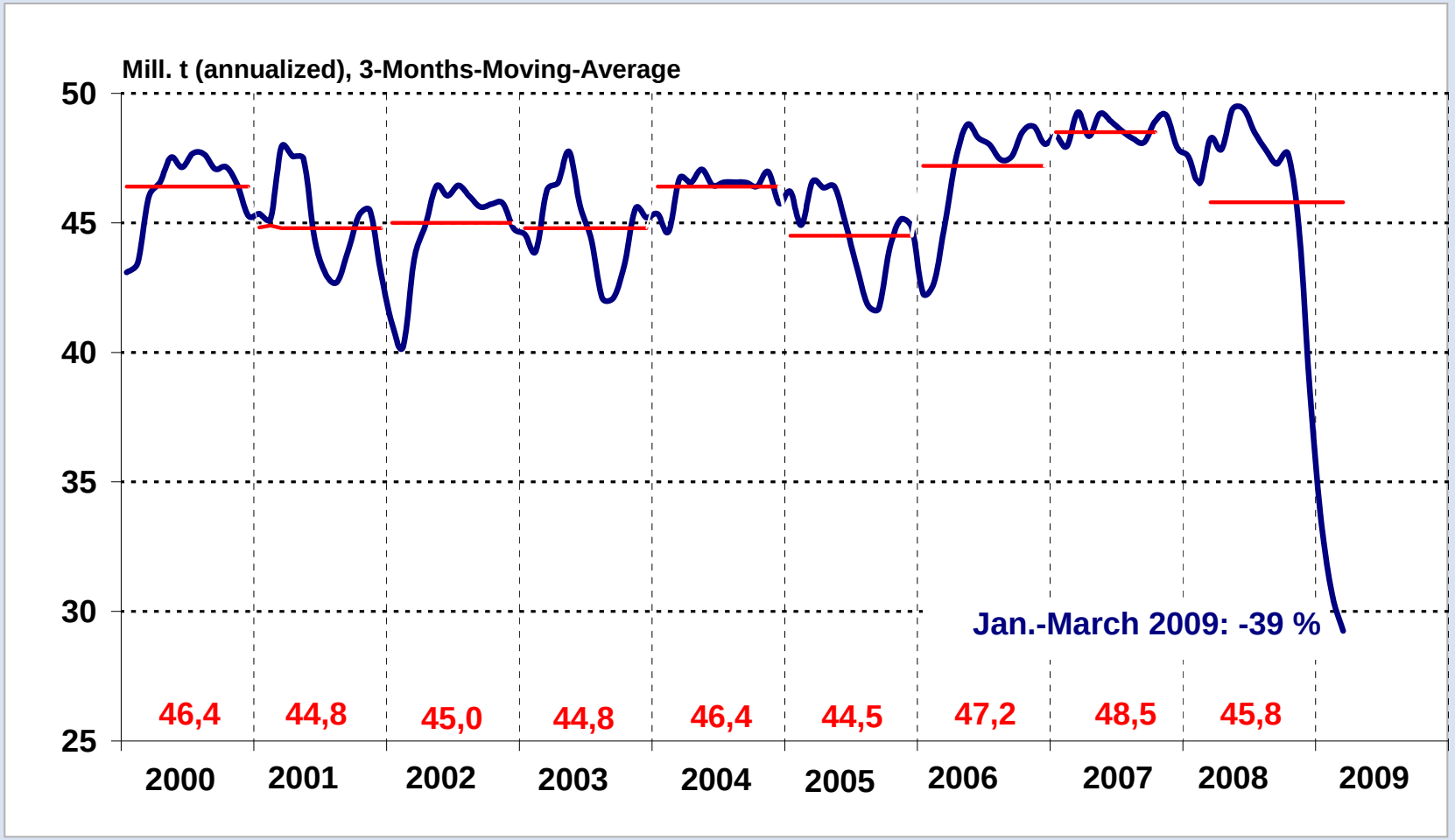
Steel – Base Material for the German Steel Industry

Market Supply with Rolled Steel ~42 Million t (2008)

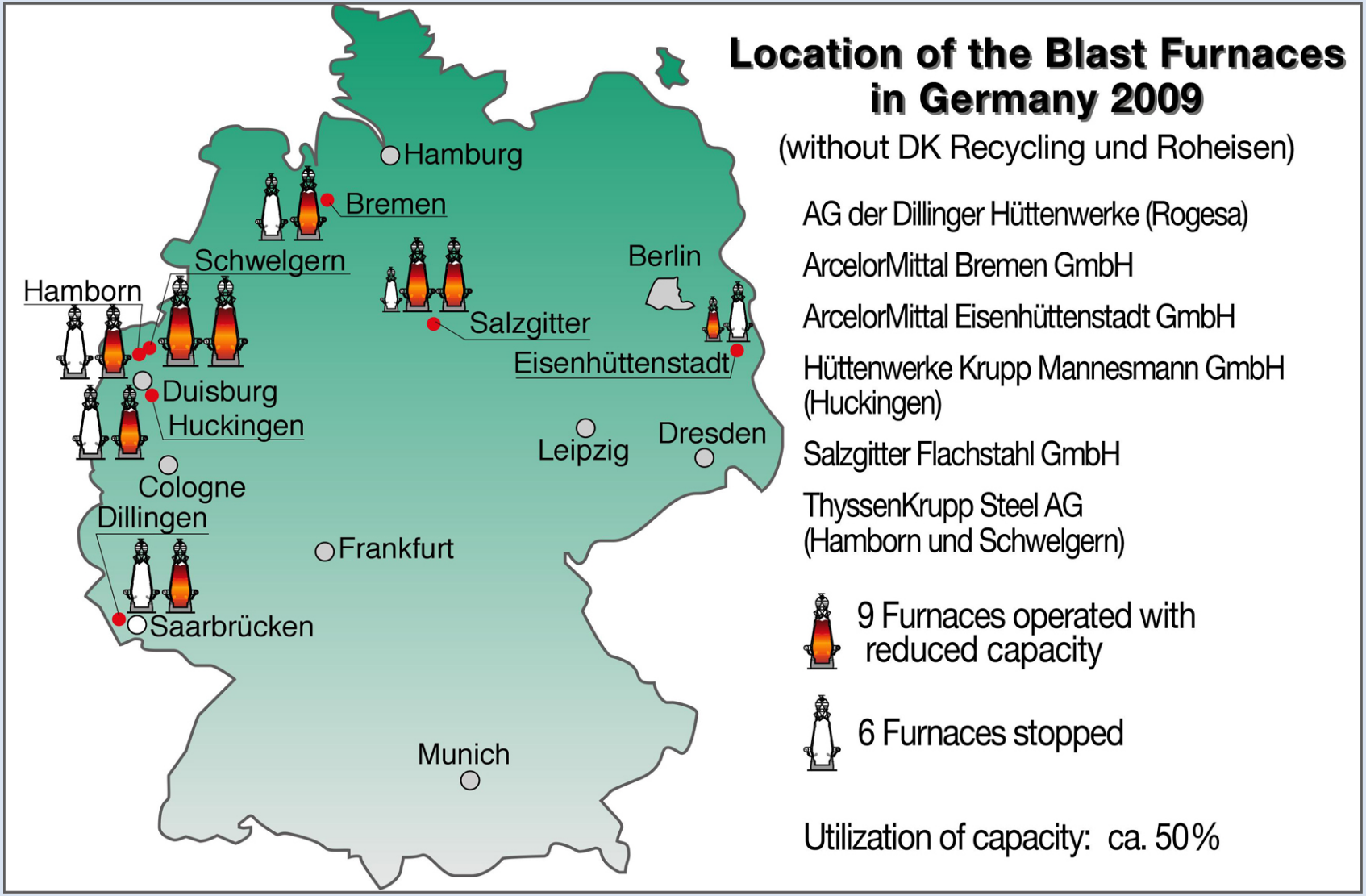


Source: German Steel Federation

Crude Steel Production in Germany



Source: German Steel Federation


Location of the Blast Furnaces in Germany 2009
(without DK Recycling und Roheisen)
Hamburg
Bremen
Schwelgern
Hamborn
Berlin
Salzgitter
Eisenhüttenstadt
Duisburg
Huckingen
Leipzig
Dresden
Cologne
Dillingen
Frankfurt
Saarbrücken
Munich
AG der Dillinger Hüttenwerke (Rogesa)
ArcelorMittal Bremen GmbH
ArcelorMittal Eisenhüttenstadt GmbH
Hüttenwerke Krupp Mannesmann GmbH (Huckingen)
Salzgitter Flachstahl GmbH
ThyssenKrupp Steel AG (Hamborn und Schwelgern)
9 Furnaces operated with reduced capacity
6 Furnaces stopped
Utilization of capacity: ca. 50%

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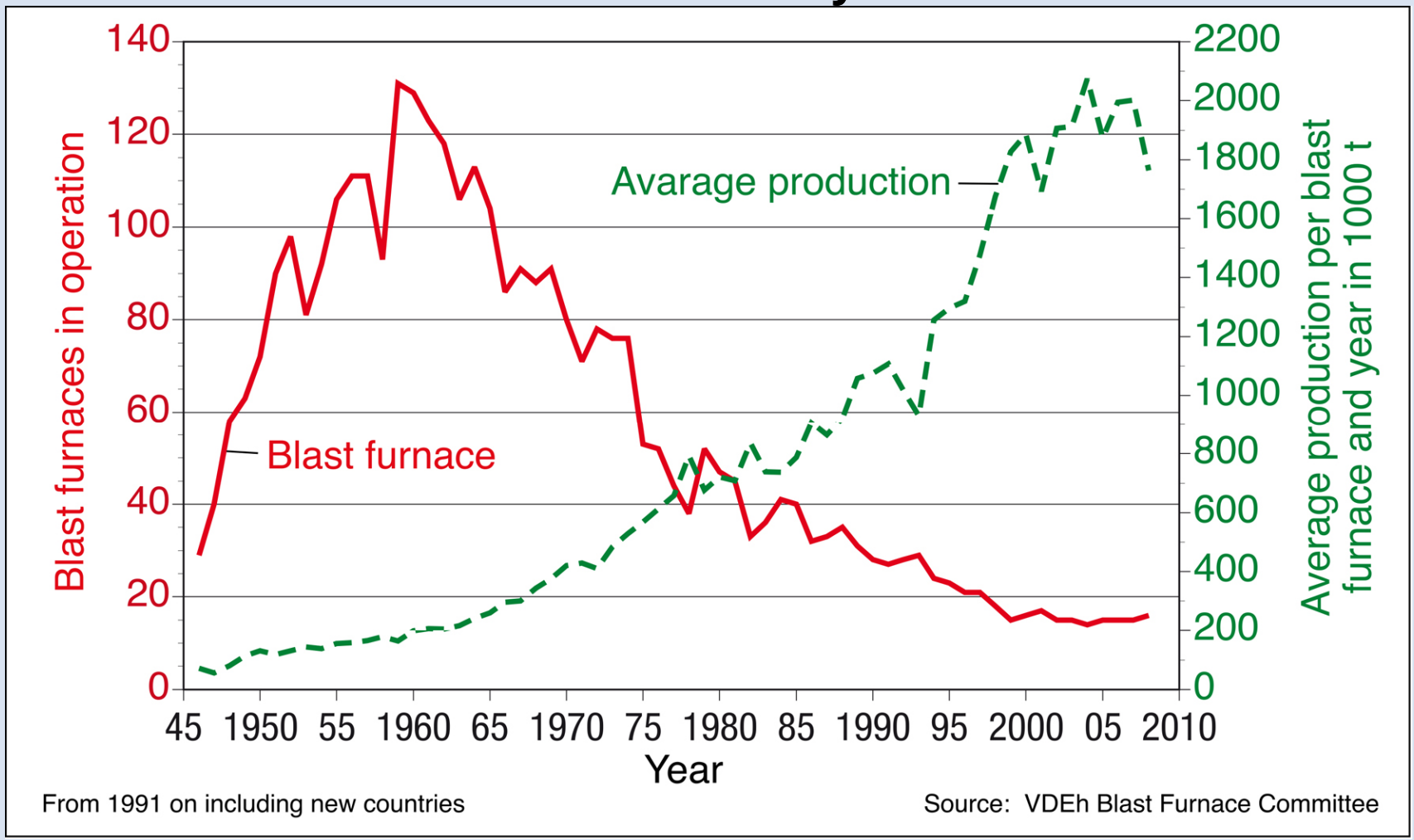
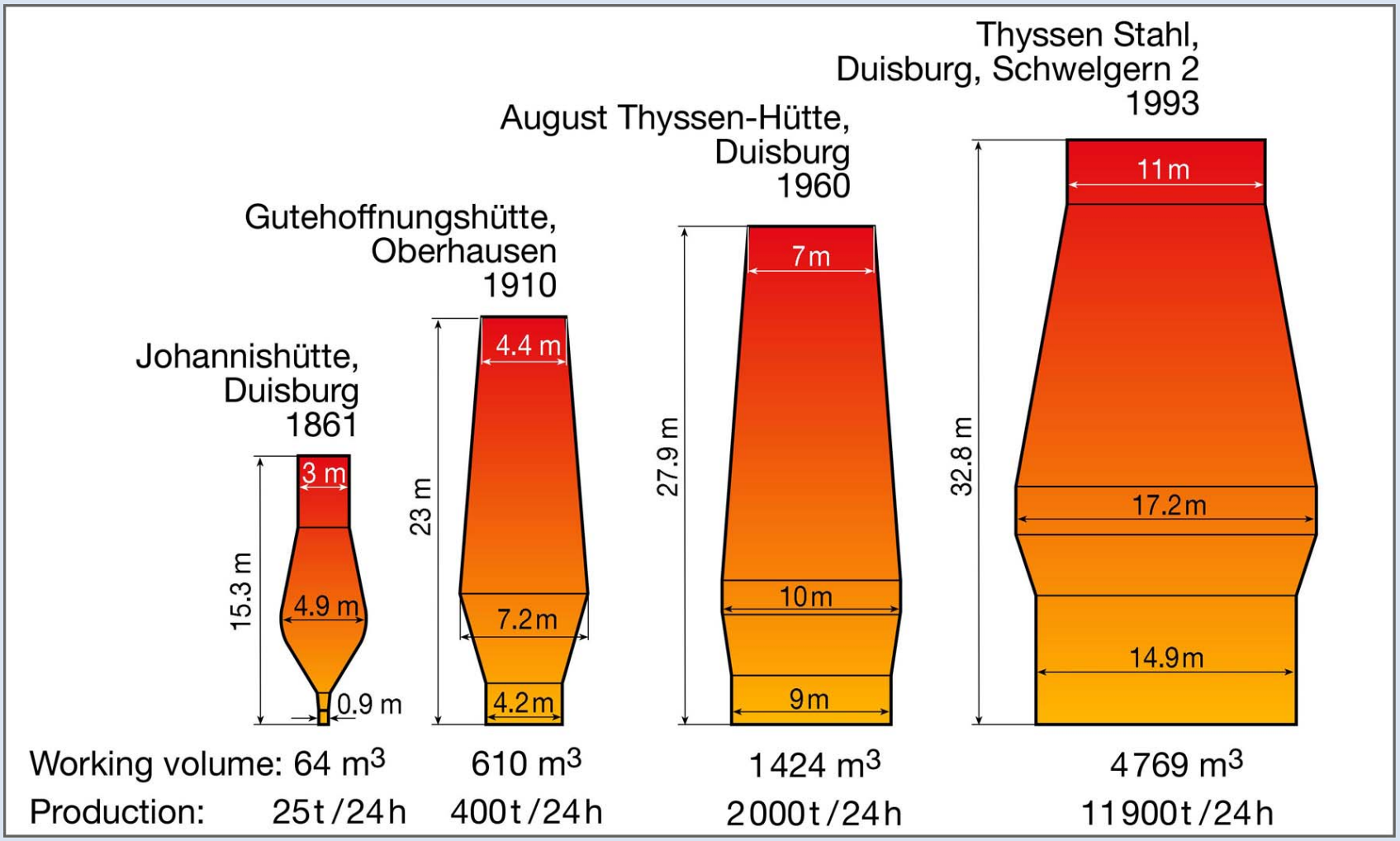
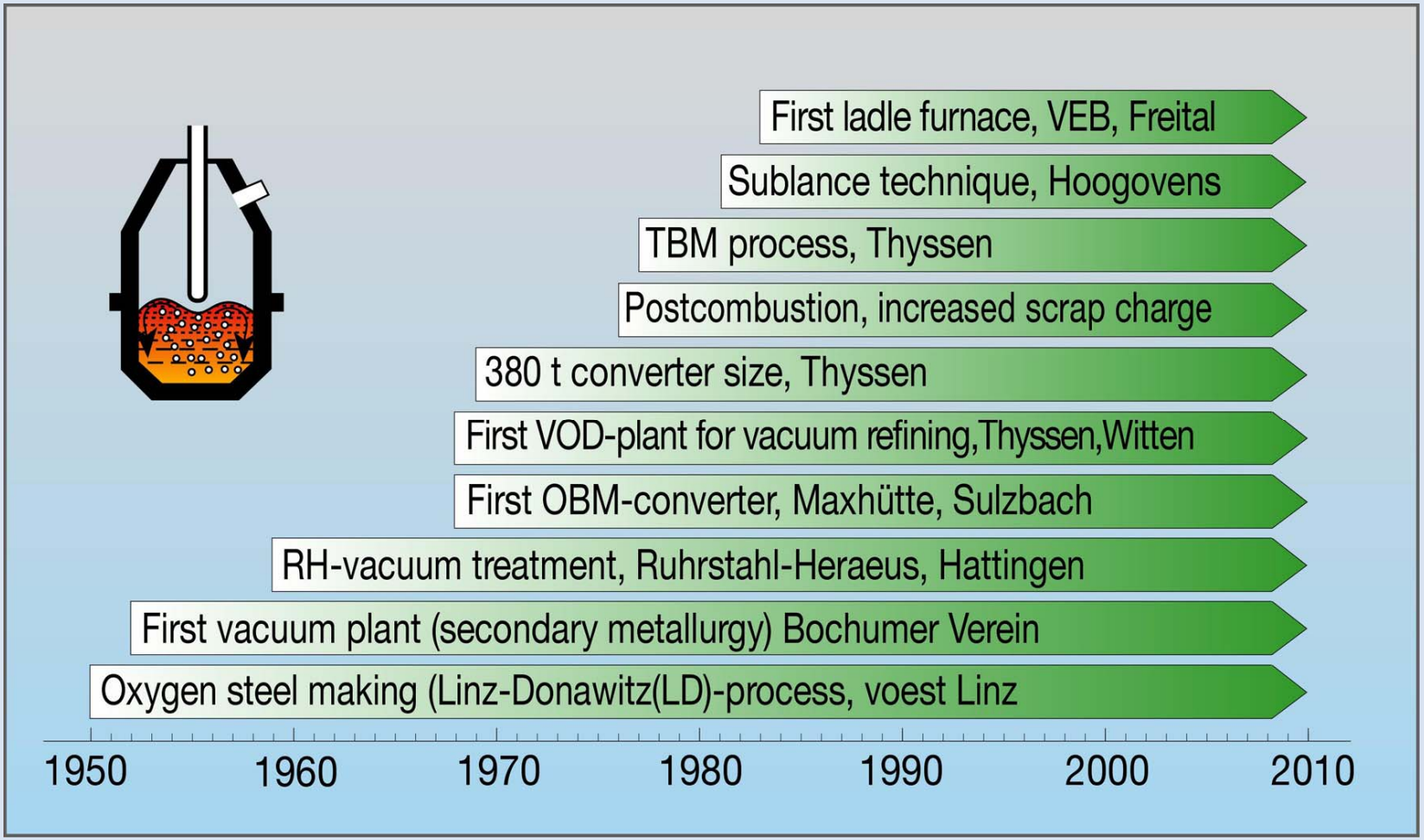
Blast Furnaces in Operation and Average Production per Blast Furnace and Year in Germany



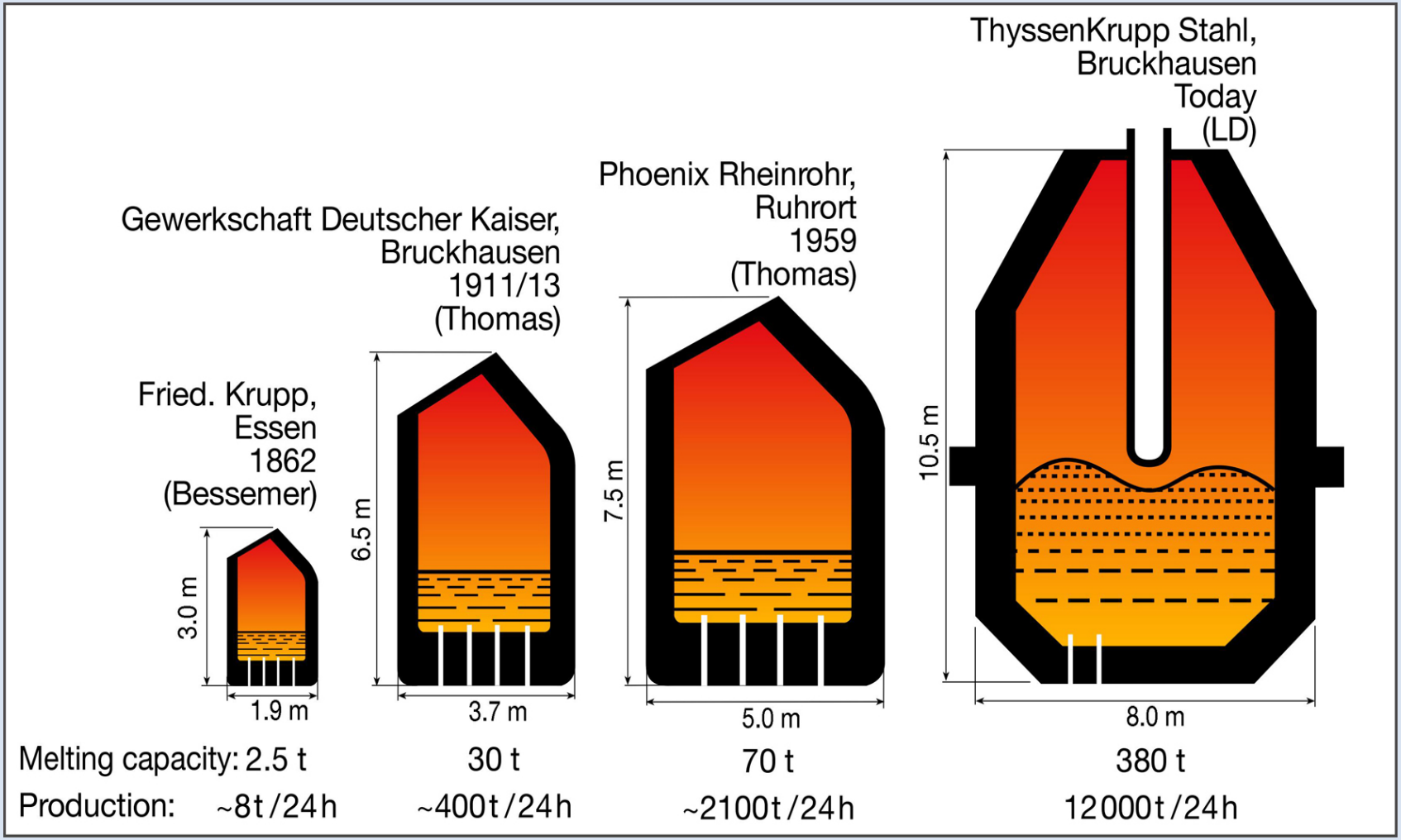
Capacity Development of Blast Furnace 1861 bis 1993



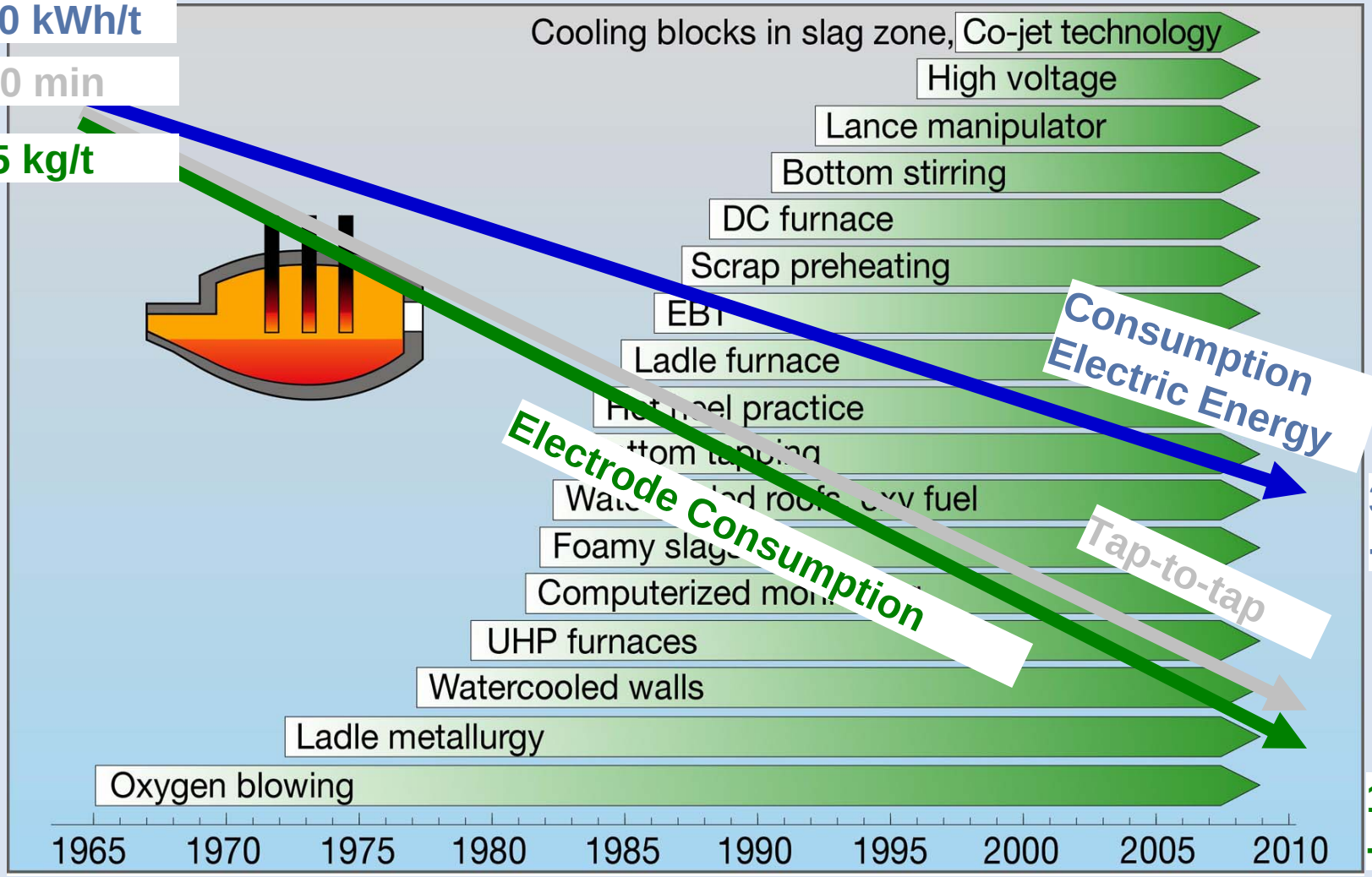
Process and Plant Technology Development for Oxygen Steelmaking



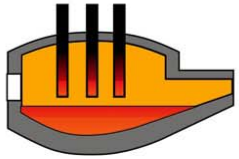
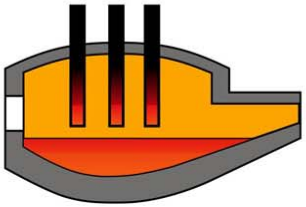
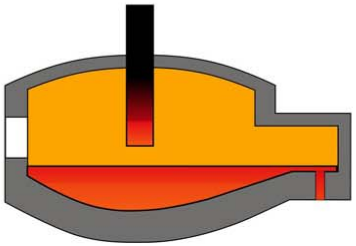
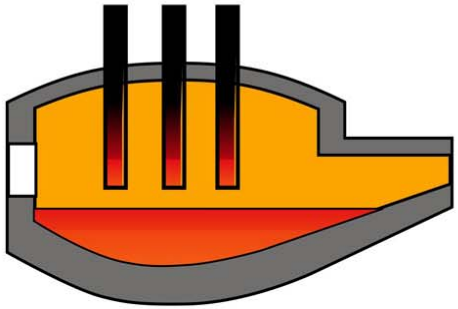
Capacity Development of Converter 1868 till now



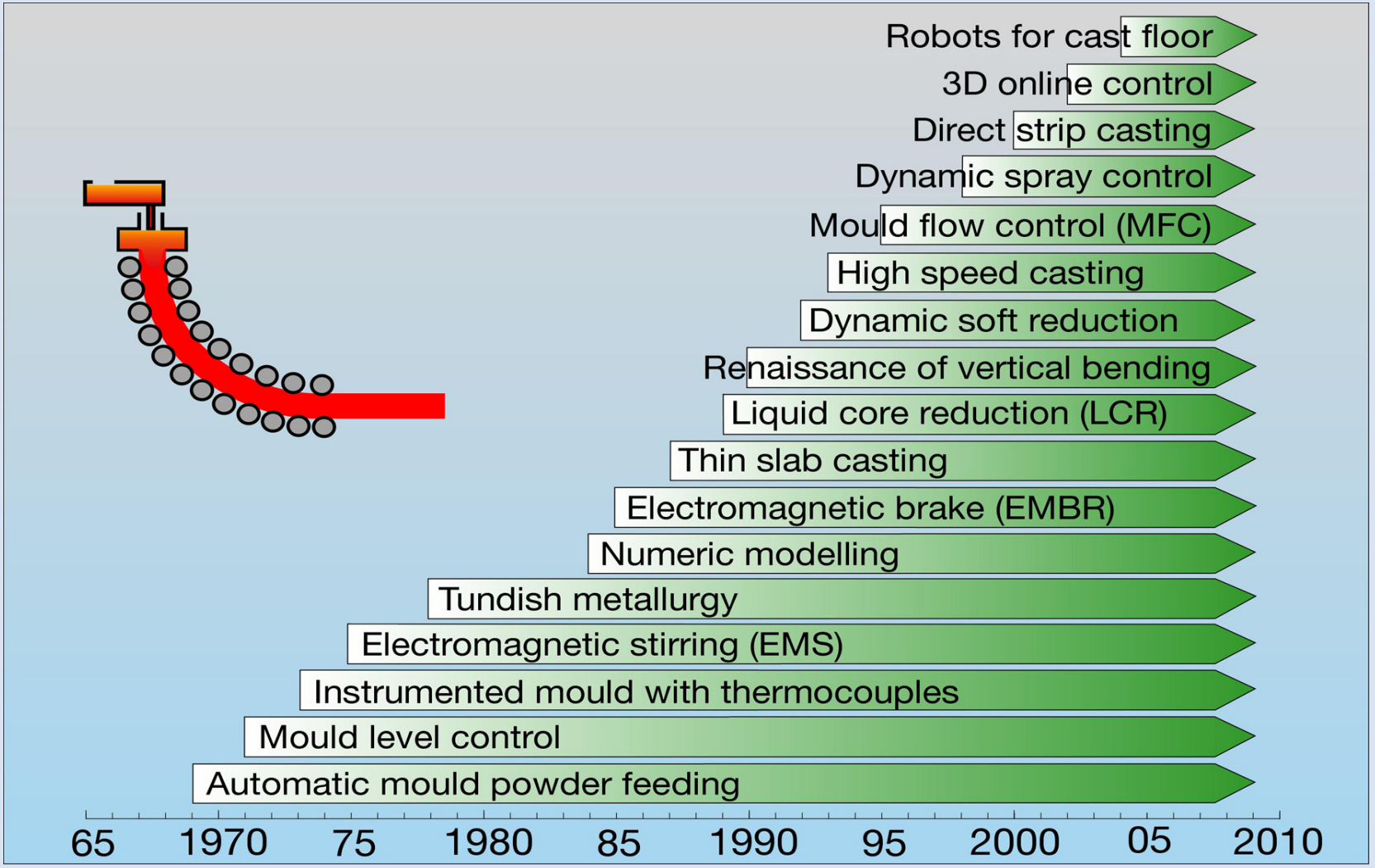
Development in EAF Technology



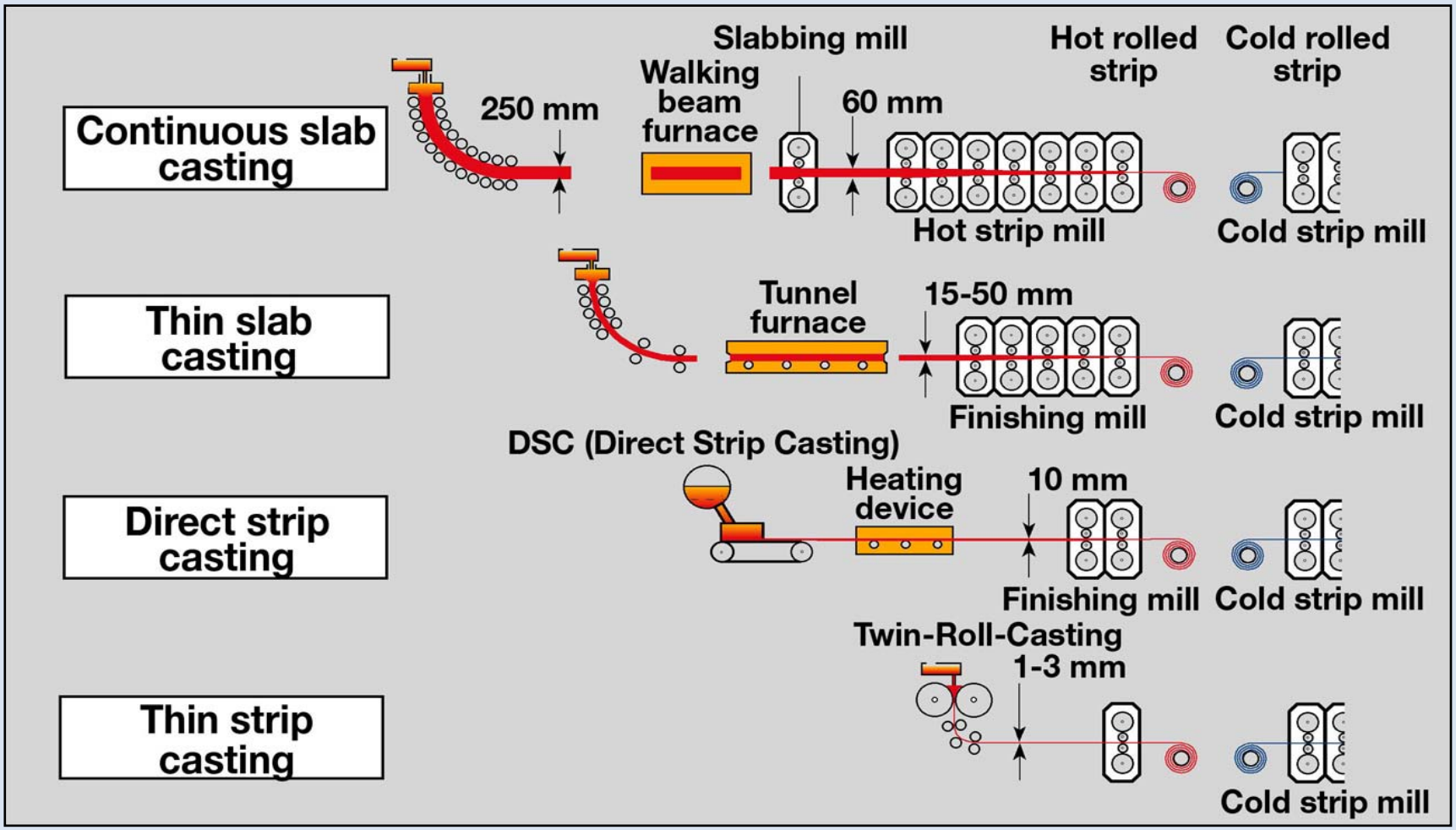
Capacity Development of Electric Arc Furnace 1906 till 2010

Stahlwerke Richard Lindenberg, Remscheid 1906	Deutsche Edelstahlwerke, Krefeld 1937	Hamburger Stahlwerke, Hamburg 1980	Salzgitter AG, Peine 1998	MKK Atakas, Iskenderun 2010
				
square 2.3 x 2.4 m	5.2 m Dia.	6.8 m Dia.	7.3 m Dia.	9.4 m Dia.
Connection power:				
0.4 MVA	10 MVA	66 MVA	140 MVA	300 MVA
Batch weight:				
1.5 t	30 t	100 t	100 t	250 t
Production:				
~10t/24h	~100t/24h	~2200t/24h	~3 700t/24h	~6 000t/24h
(Molten metal charge)				

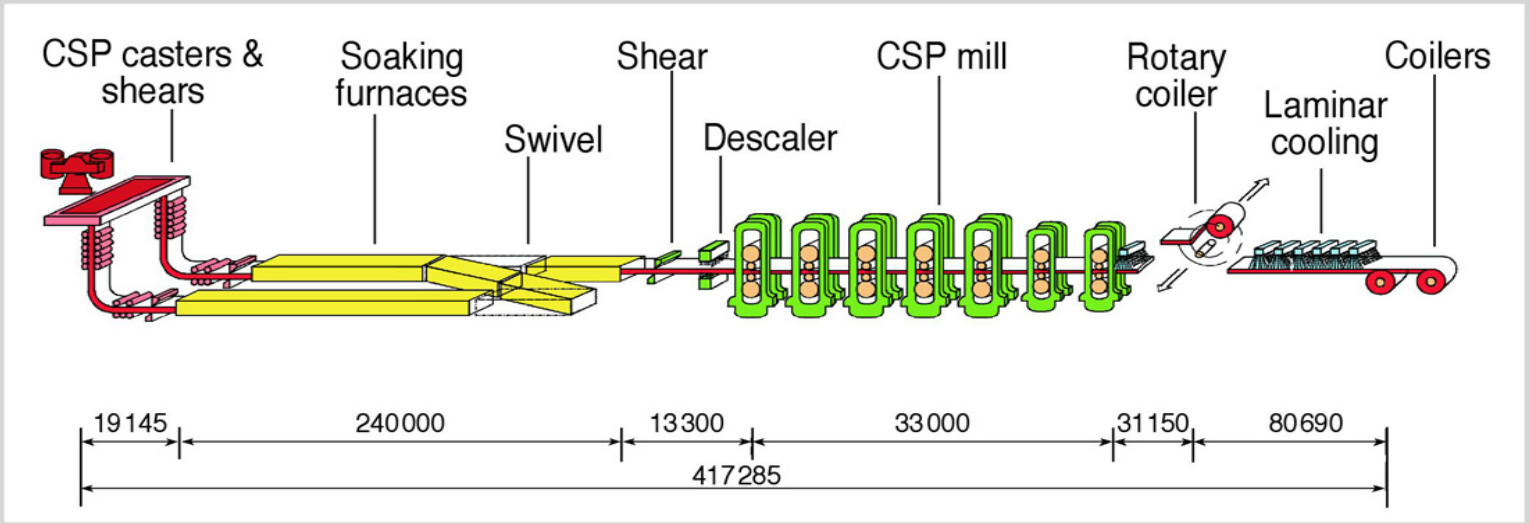
Development in Continuous Casting Technology



Reducing the Process Chain for the Production of Hot Rolled Strip



Compact Strip Production CSP

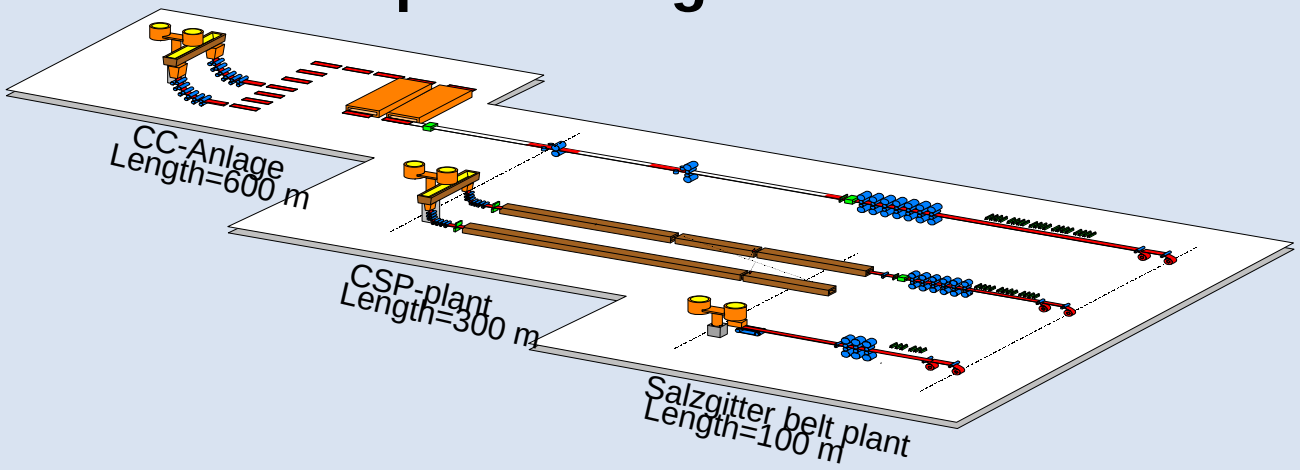


Source: SMS Demag

Advantages:

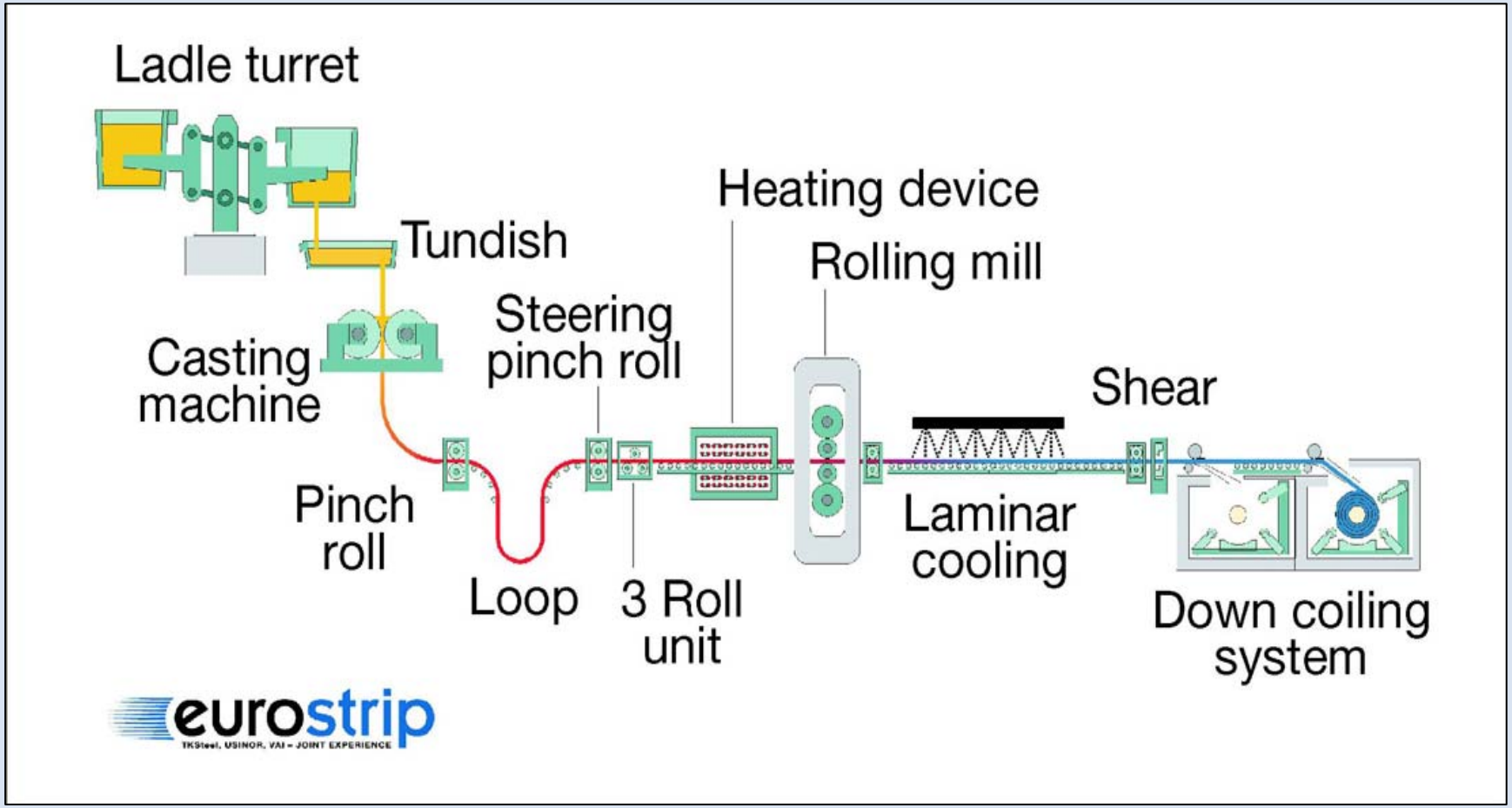
- Higher solidification speed, lower micro and macro segregation
- Homogeneous microstructure
- Lower energy consumption
- Lower amount of space needed
- Lower specific investments,,

Advantages of Near Net Shape Casting



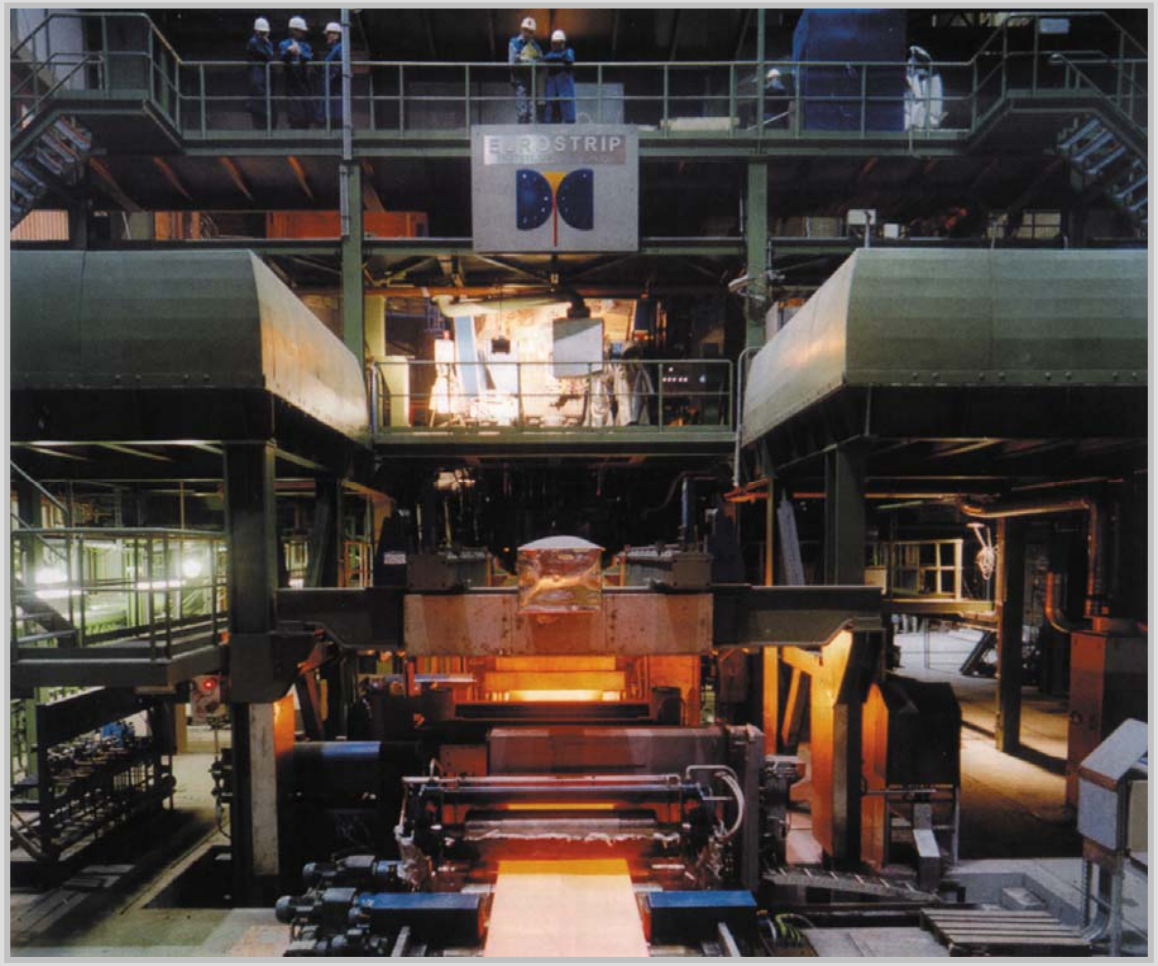
- Shortening of the process chain
  - Energy saving, environmental protection
  - Avoiding of transport costs
  - More flexible production
- Simplification of the process steps
  (Heating furnaces, hot rolling are dropped)
- New steel concepts are realizable

Final Layout of the Industrial Strip Casting Plant in Krefeld (2002)



Source: ThyssenKrupp Stahl

Strip casting – Innovation for the Production of Flat Products



Strip casting plant Eurostrip Krefeld in operation

Product:
Stainless steel coils
1.5 to 4.5 mm thick
1450 mm width

First cast:
10 December 1999
Weight of melt 90 t

BGH Edelstahl Siegen GmbH, Siegen (Ger)

New forging plant with 40 MN forging press,

- **New full automatically precision straightening press for bars up to 18 m length and 350 mm diameter**

ThyssenKrupp VDM

- Leading producer of nickel alloys, cobalt alloys and specialty steels for demanding industries (e.g. Aerospace)
- 45 MN Open-die Forging Plant

SMS Meer GmbH

- **Five large size open-die forging presses in the range from 80 MN up to 120MN presses in order**

Forging manipulator with capacity of 250 tons

- currently strongest forging manipulator worldwide

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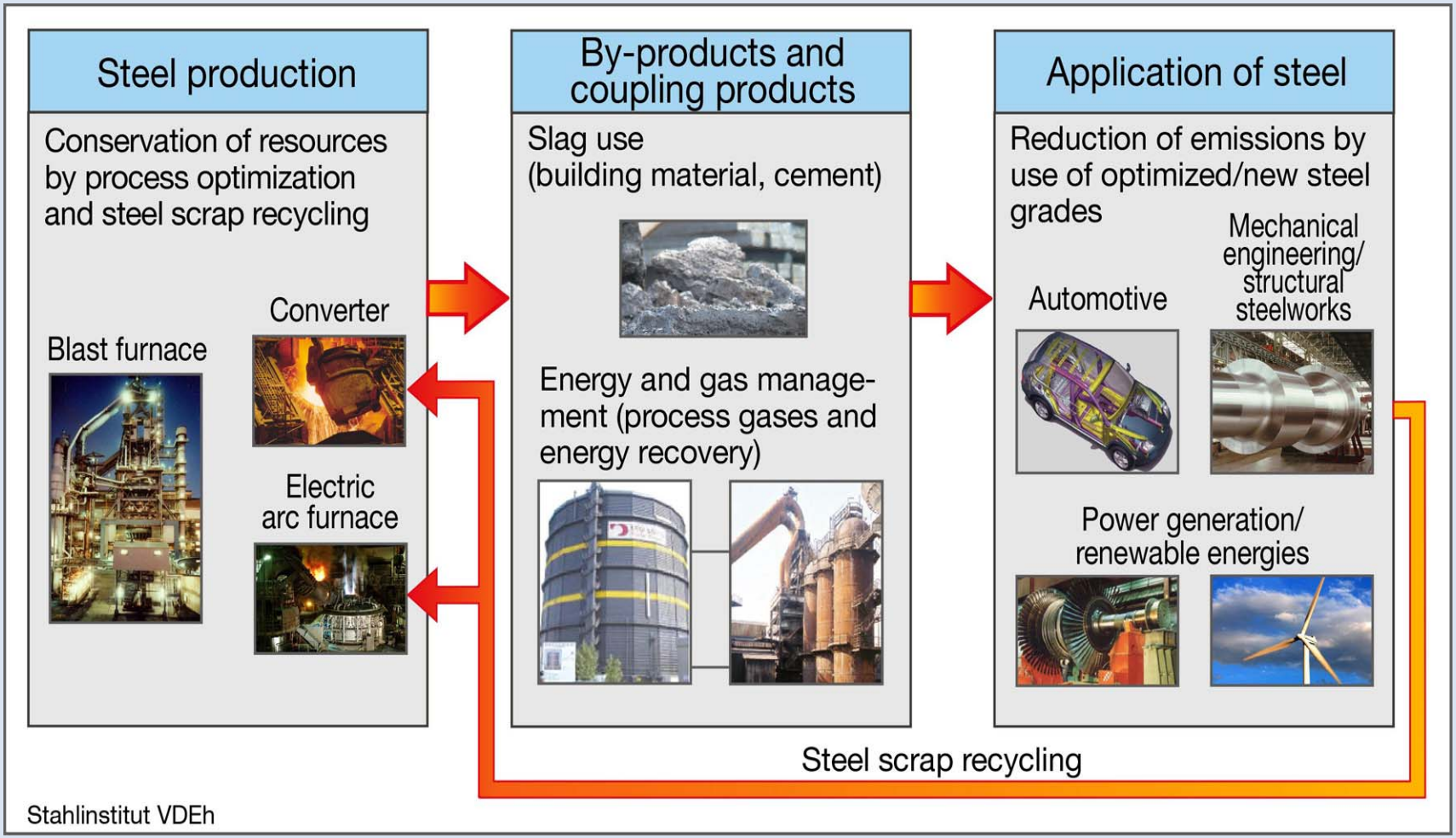
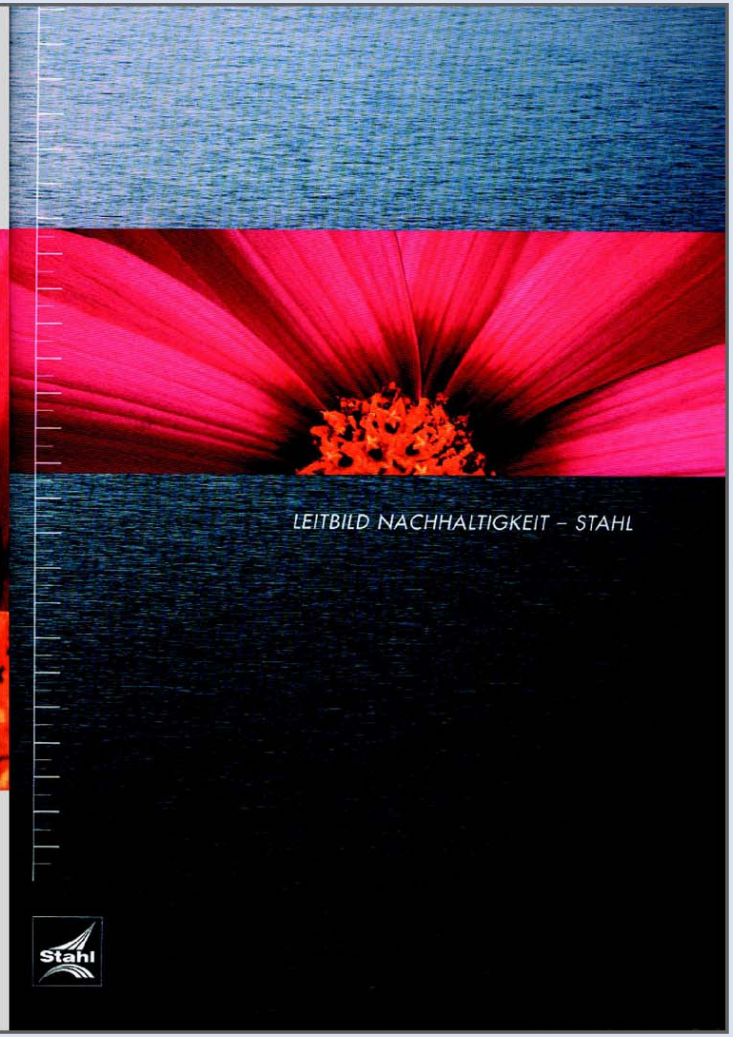
Resource Efficiency of the Steel Industry



Development of Indicators



Indicators of Sustainable Steel

I. Economy

- Steel production
- Steel utilization
- Profitability
- Trading
- Productivity of work force
- Expenditures for steel research

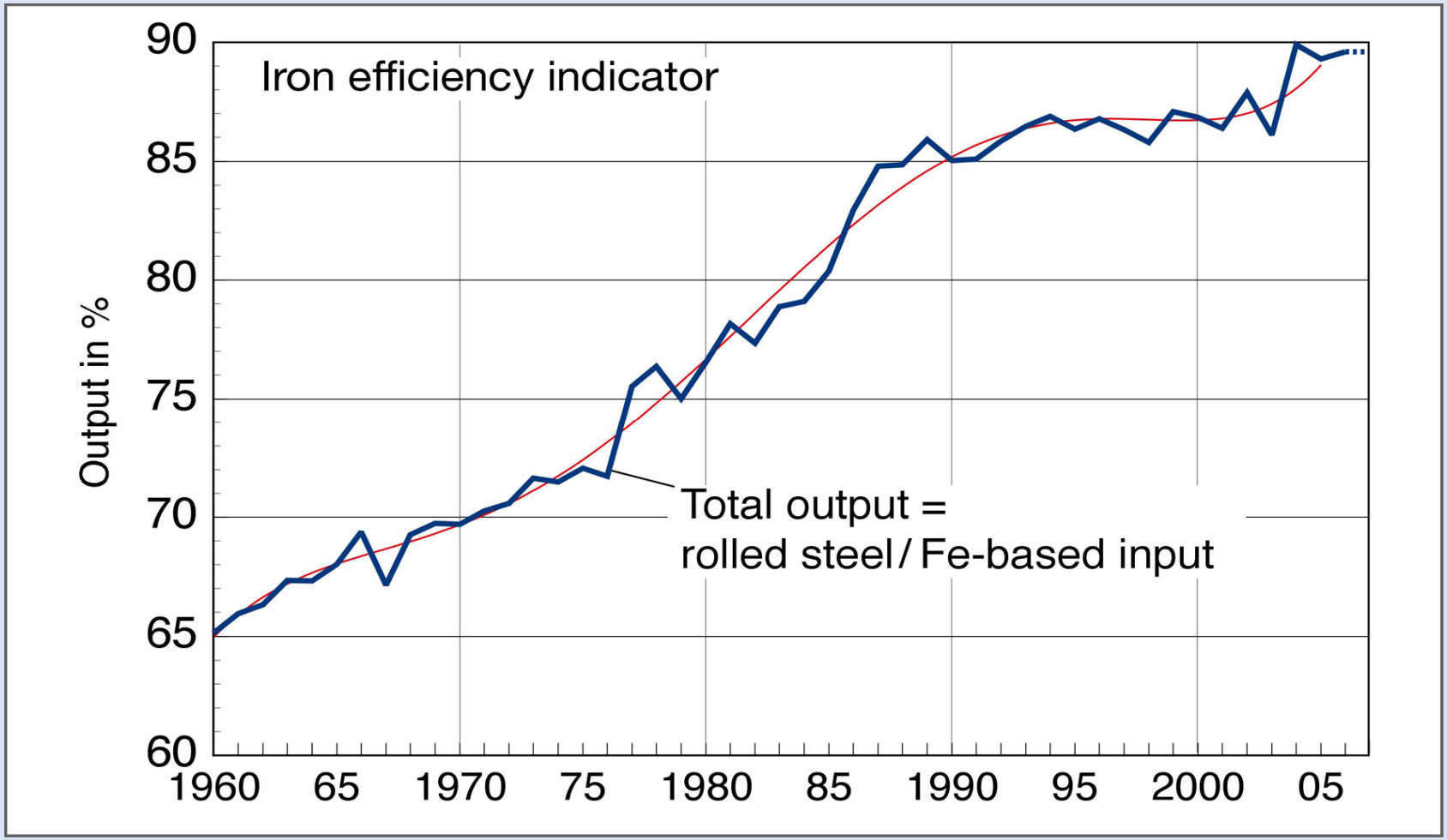
II. Raw material-, energy-, and environment efficiency

- Energy efficiency
- Iron efficiency
- Refractory efficiency
- CO_2 reduction
- Scrap recycling
- Slag production and utilization
- Water utilization
- Dust emission
- Utilization of transport systems

III. Human indicators

- Accident frequency rate
- Share of skilled workers
- Share of engineers
- Share of apprentices
- Training days per employee
- Ideas management

Efficient Use of Reseurces by the Steel Industry in Germany

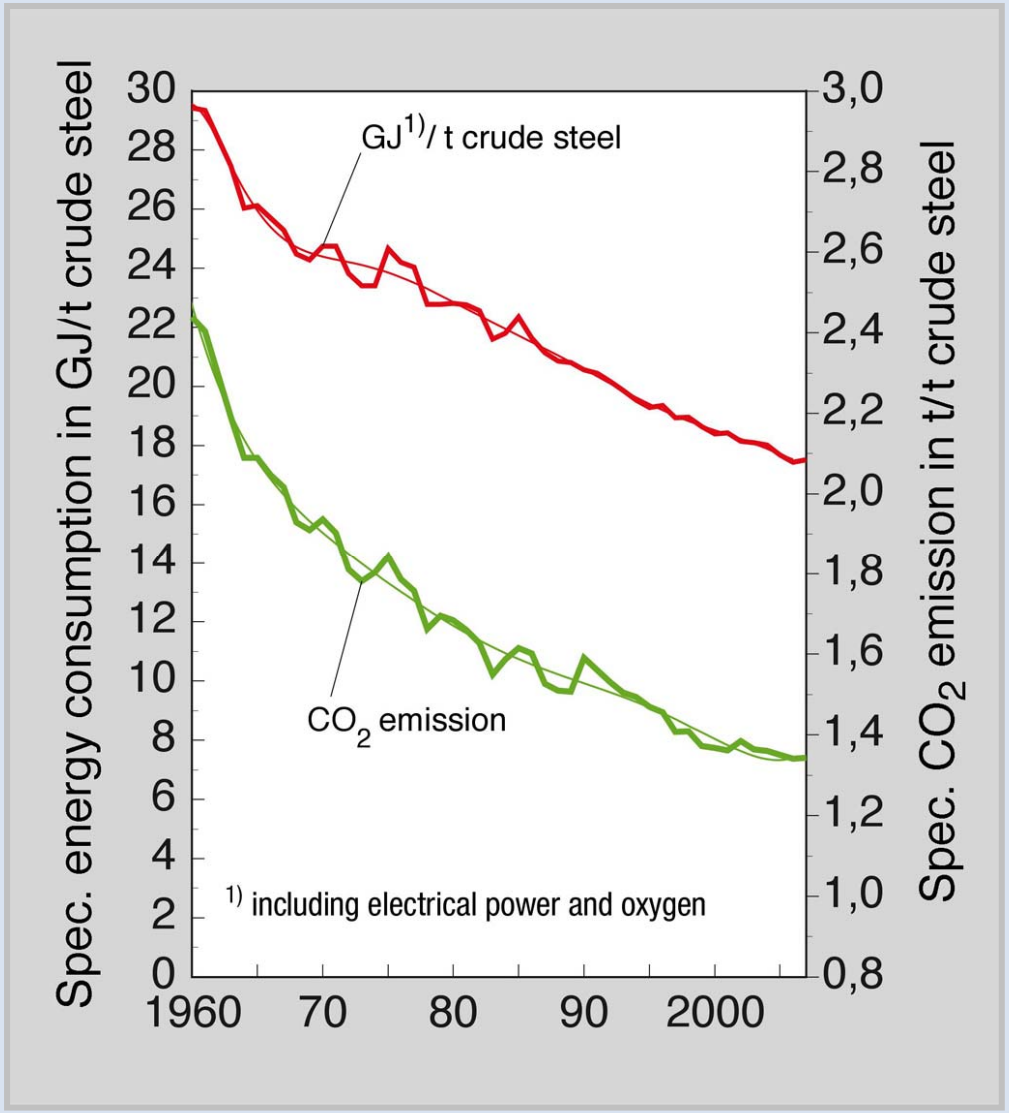


Energy Efficiency and CO_2 Emission of the Steel Industry in Germany

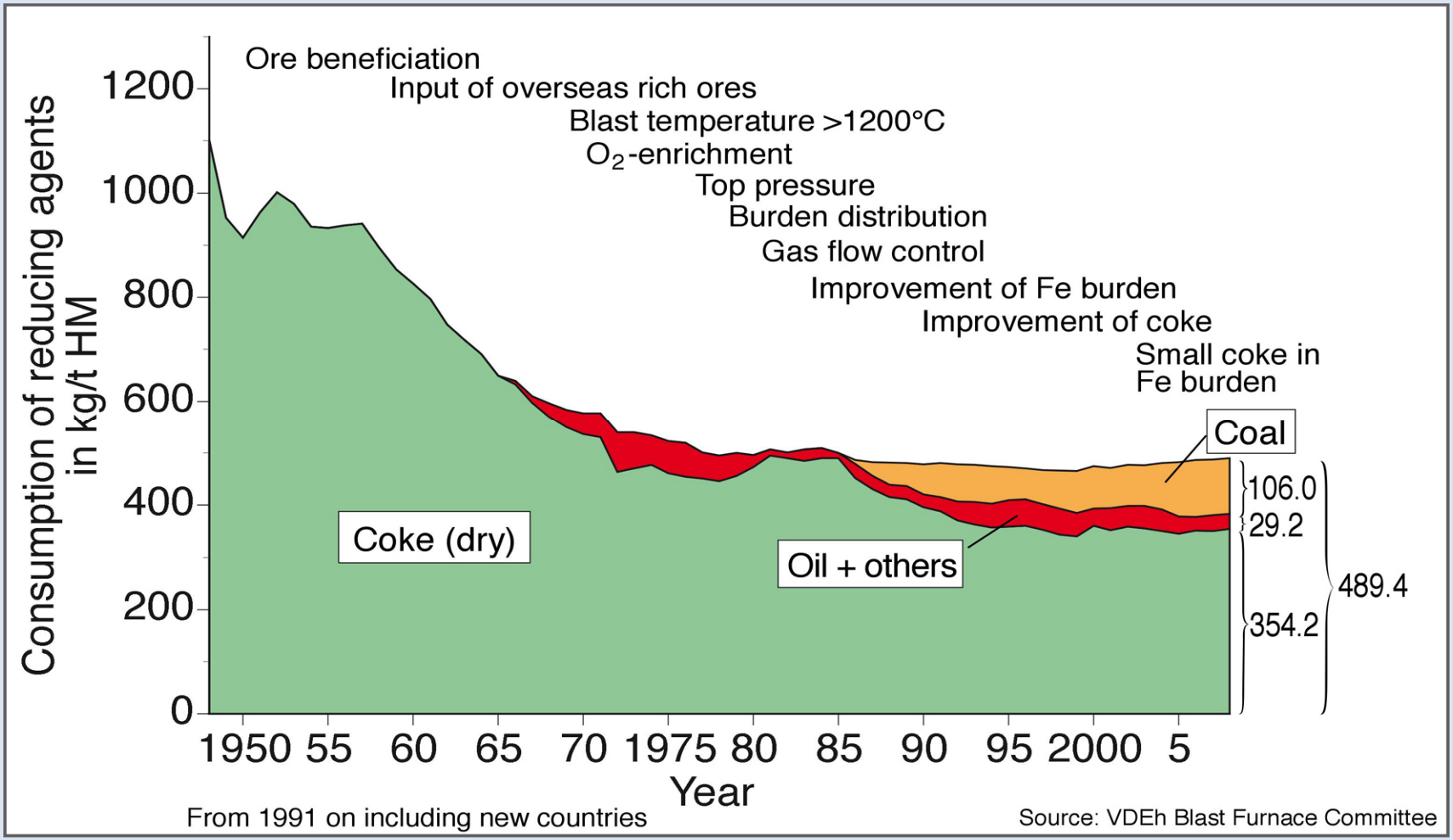
Reduced CO_2 emission: comparison 1990/2007

-11.1 million t CO_2

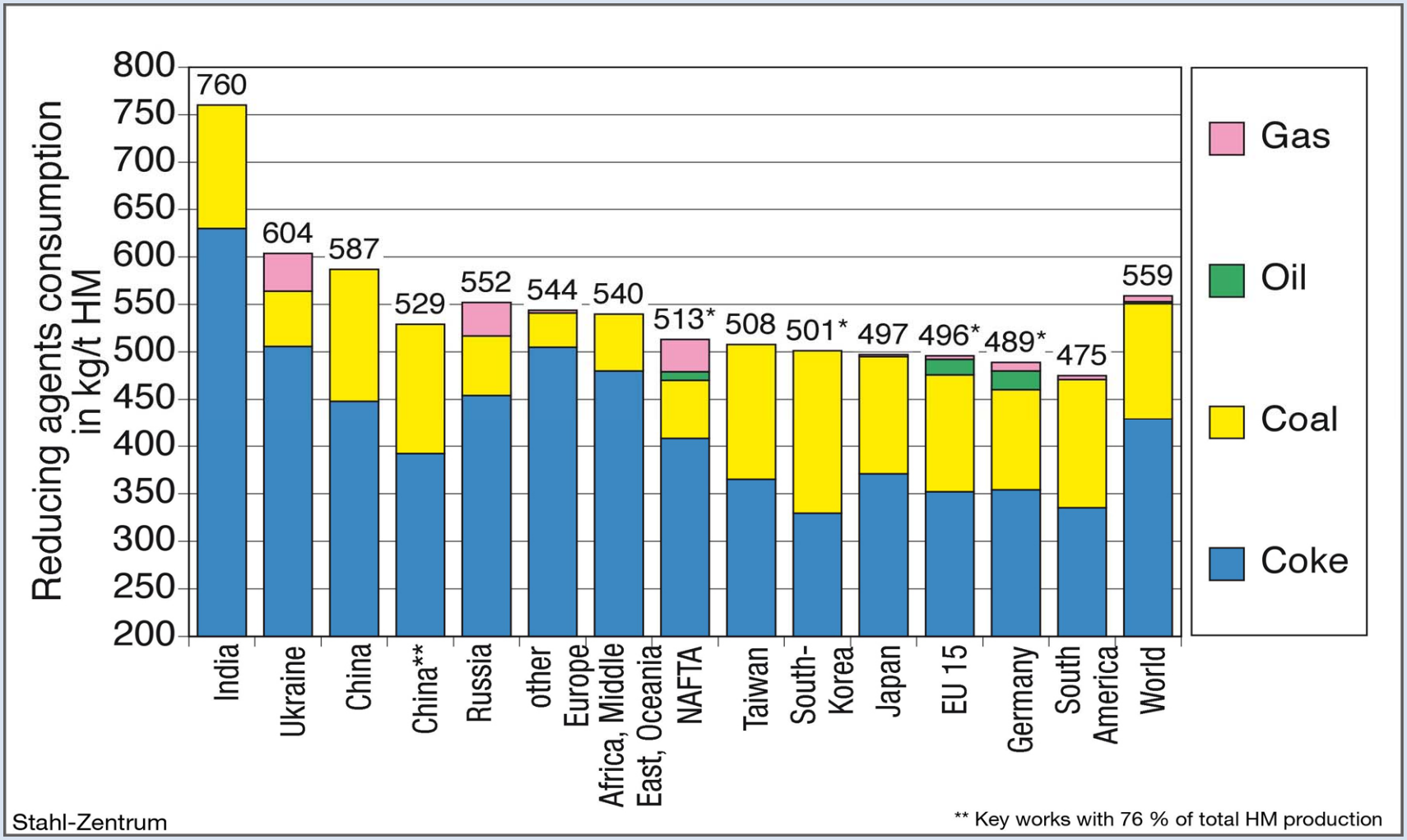
Equal to 4.35 million middle-sized automobiles (15,000 km/a; 170g CO_2/km)



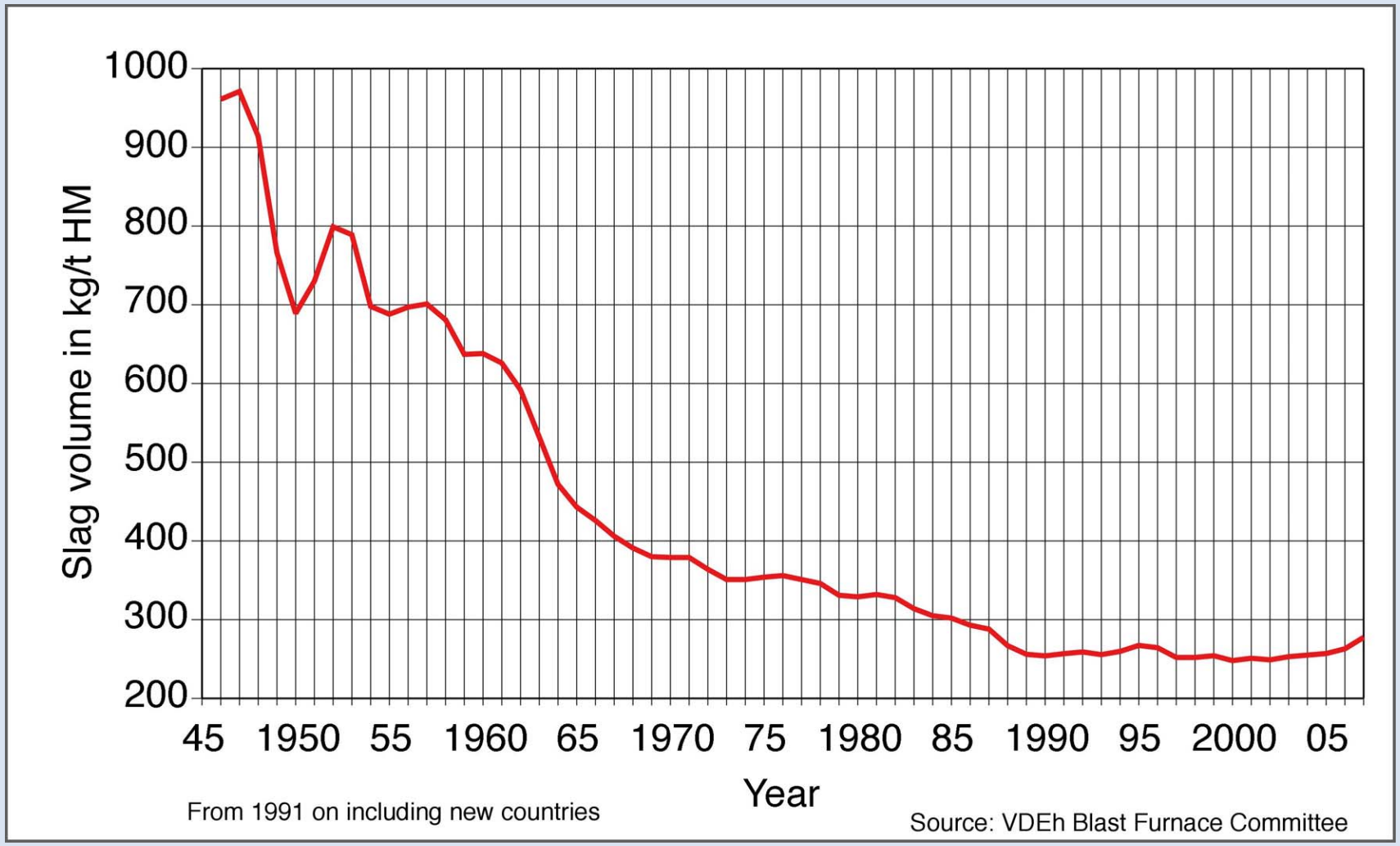
Average Consumption of Reducing Agents of the Blast Furnaces in Germany 2008



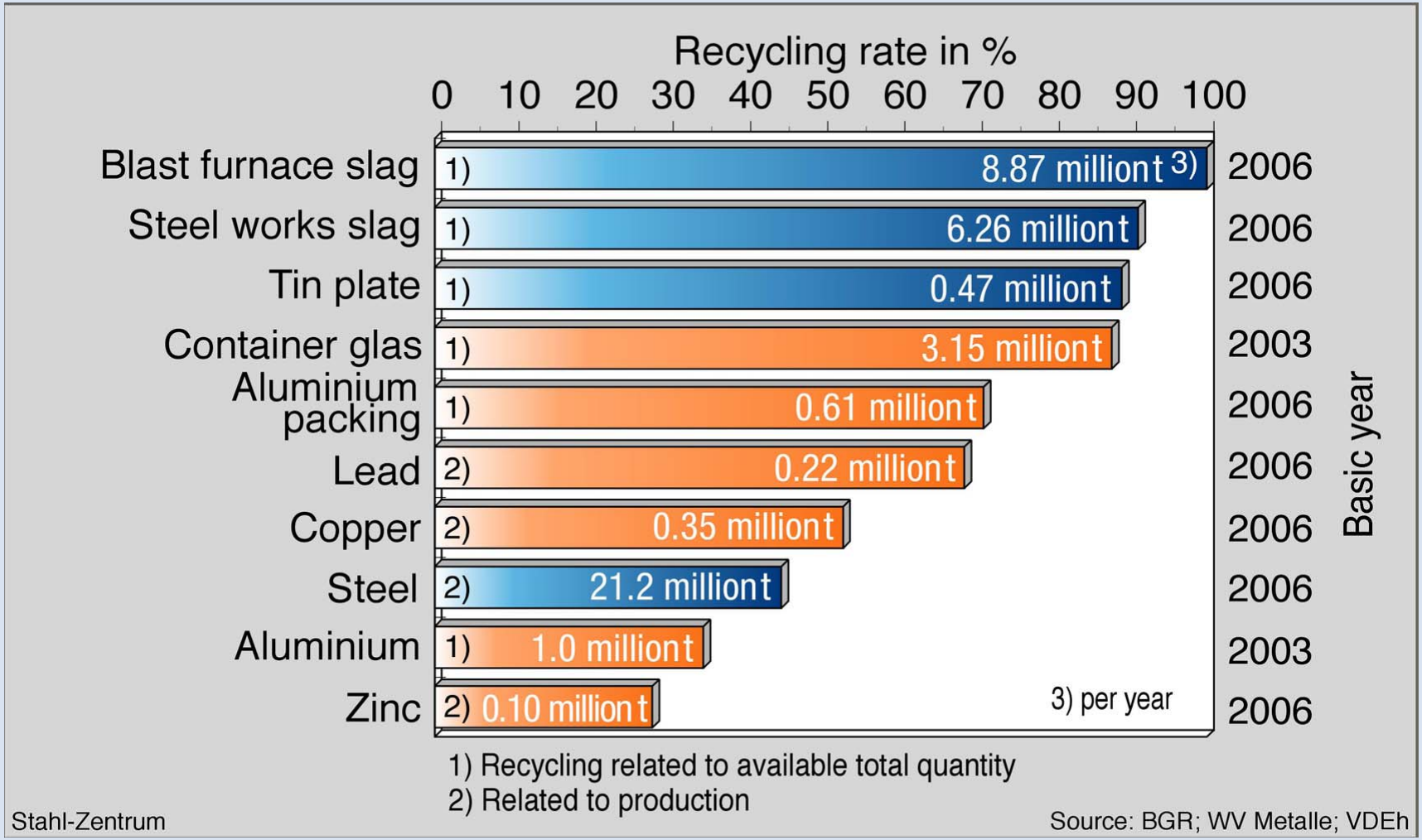
Reducing Agents Consumption in the Blast Furnace 2007/2008 worldwide



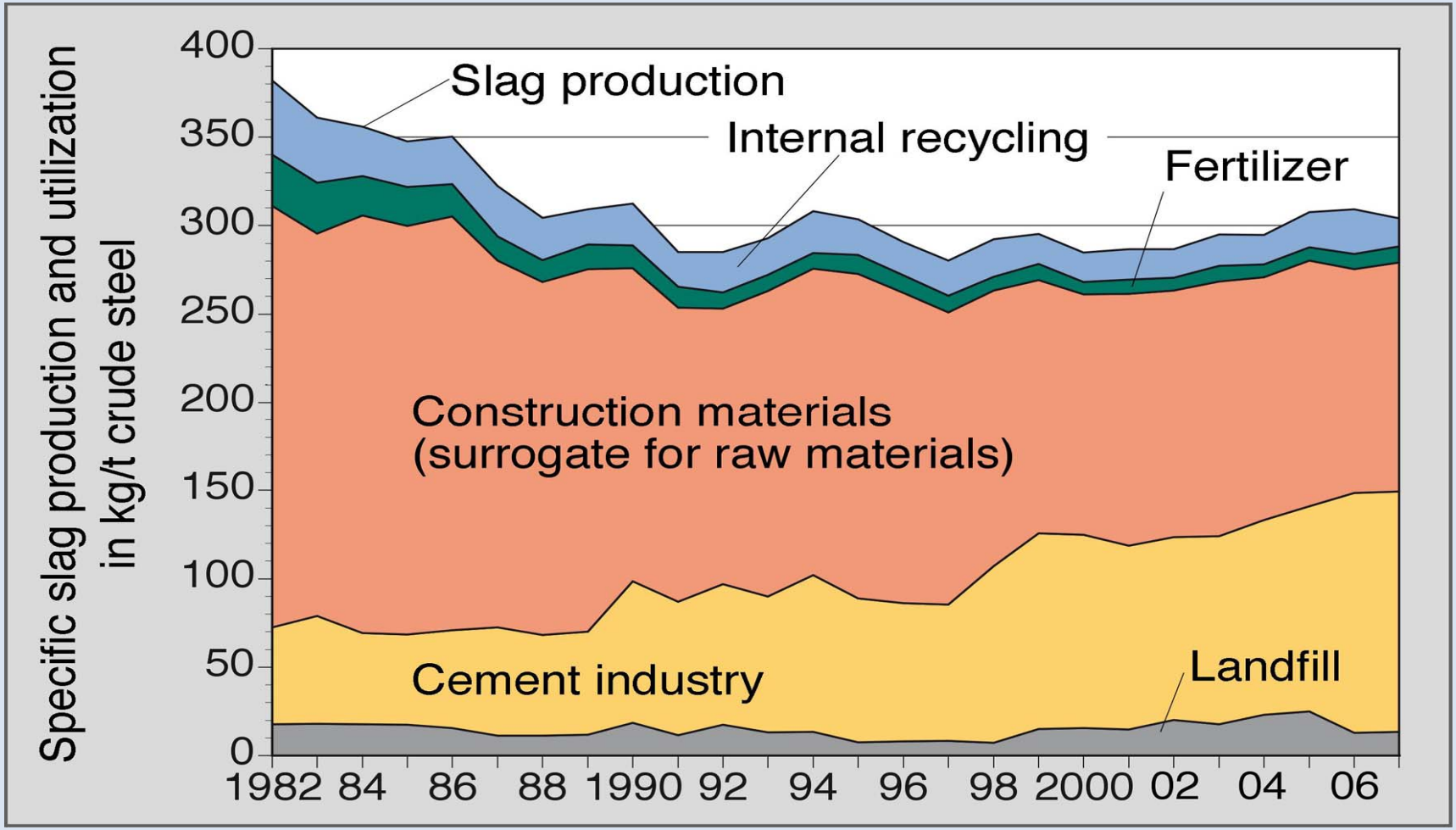
Average Slag Volume of Blast Furnaces in Germany



Use and Recycling Rate in Germany



Slag production and utilization, aim: 100% utilization



Source: Stahl-Zentrum

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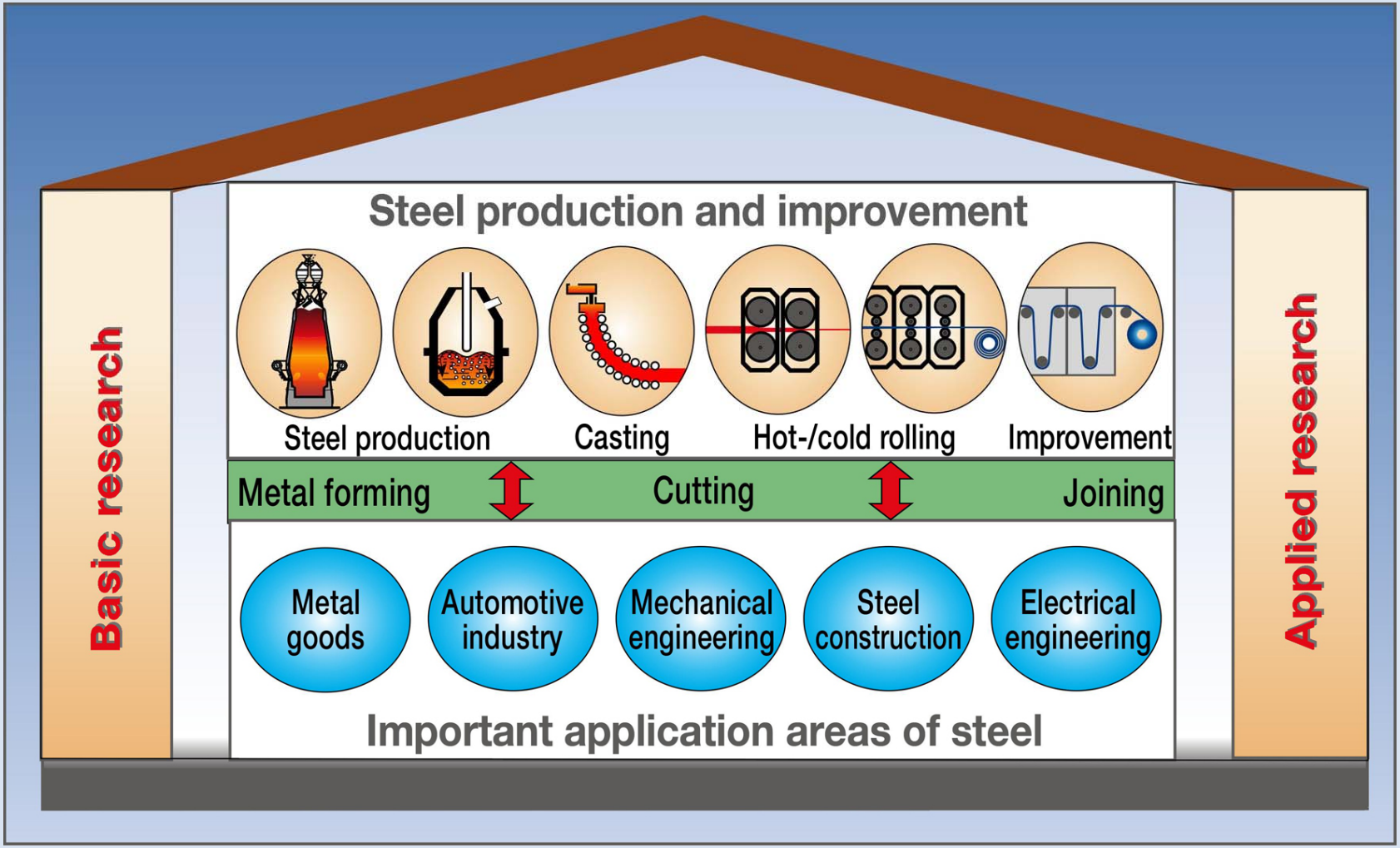
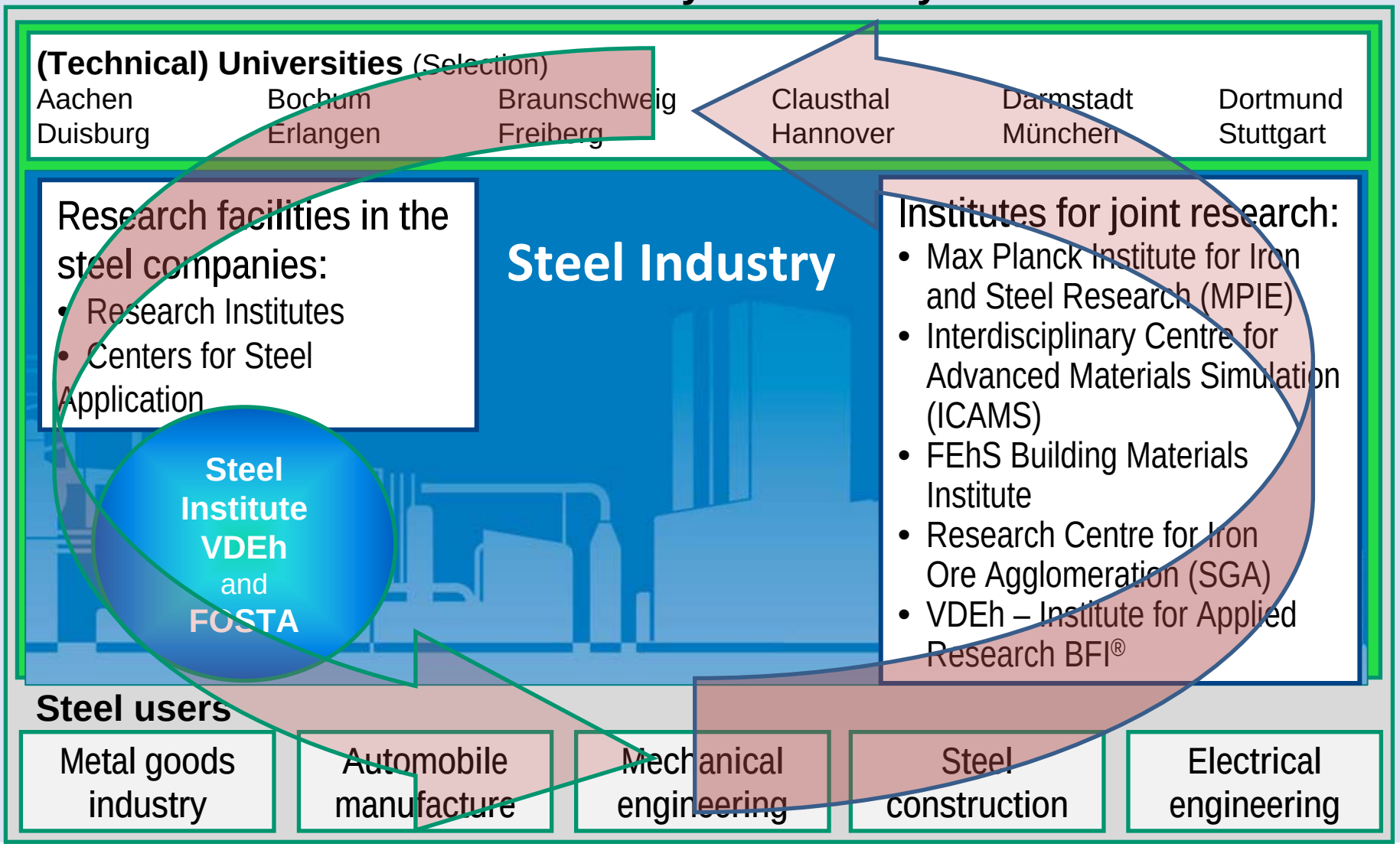
Research as a Supporting Element of the Steel Sector

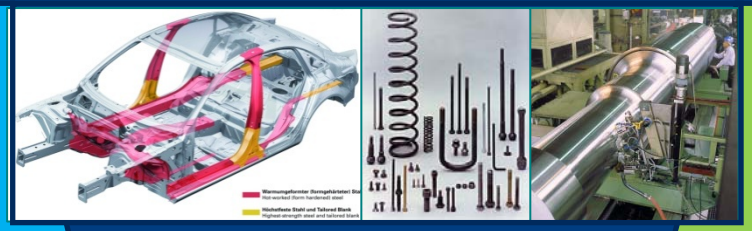


Joint Research of the Steel Industry in Germany



Representation of steel in selected user and testing associations and certification bodies in Germany

- VDMA Verband deutscher Maschinen- und Anlagenbau
- VDA Verband der Automobilindustrie
- WSM Wirtschaftsverband Stahl- und Metallverarbeitung
- VGB Vereinigung der Großkraftwerksbetreiber
- FDBR Fachverband Dampfkessel-, Behälter- und Rohrleitungsbau
- DSTV Deutscher Stahlbauverband

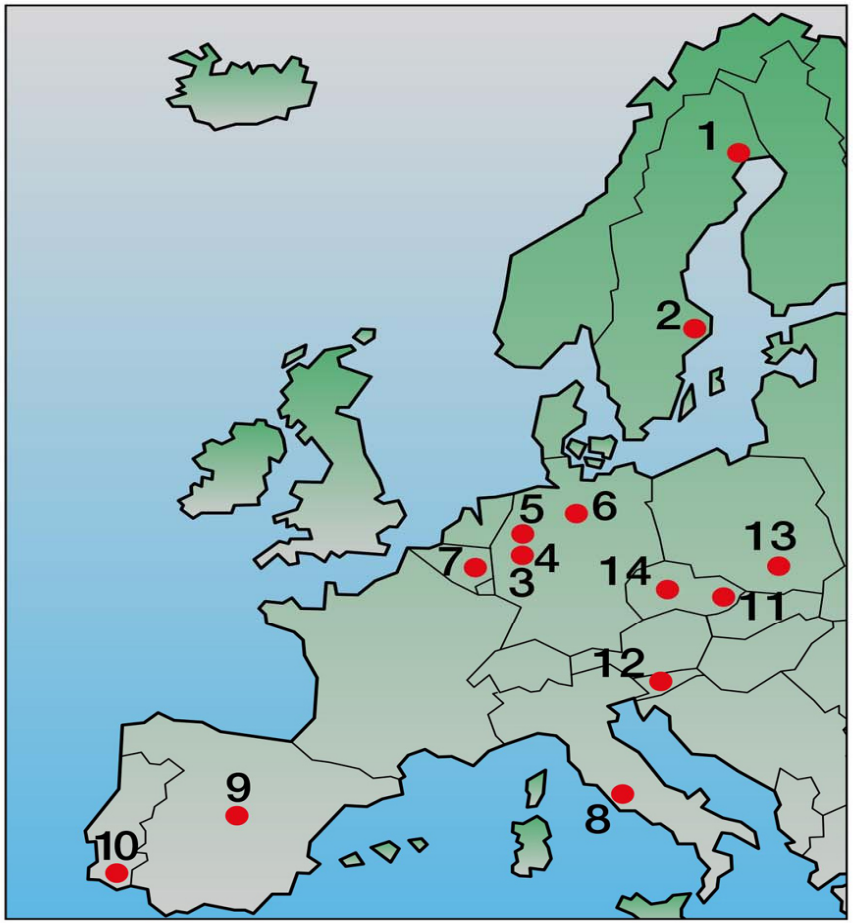


Materials Committee of Steel Institute VDEh and FOSTA Research Association for Steel Application

Steel relevant Instituts of Universities, of FhG, of MPG, ...

- AWT Arbeitsgemeinschaft Wärmebehandlung und Werkstofftechnik
- DVS Deutscher Verband für Schweißen und verwandte Verfahren
- DVM Deutscher Verband für Materialforschung und -prüfung
- DGZfP Deutsche Gesellschaft für Zerstörungsfreie Prüfung
- GfKORR (DECHEMA) Gesellschaft für Korrosionsschutz
- VdTÜV Verband der technischen Überwachungsvereinigungen
- GL Germanischer Lloyd

Network of Centres for Steel Research in EU 27



1. MEFOS, Luleå
2. KIMAB, Stockholm
3. BFI, Düsseldorf
4. MPIE, Düsseldorf
5. FEhS, Duisburg
6. SGA, Othfresen
7. CRM, Liege
8. CSM, Rome
9. CENIM, Madrid
10. ISQ, Cabanas-Leiao
11. Vitkovice-R&D, Ostrava
12. IMT, Ljubljana
13. IMZ, Gliwice
14. Skoda Research, Plzen

German Steel Innovation Award

1989 – 2009:
20 years of success

2009: 644 entries

Again,
one of the
most important awards
in Germany.

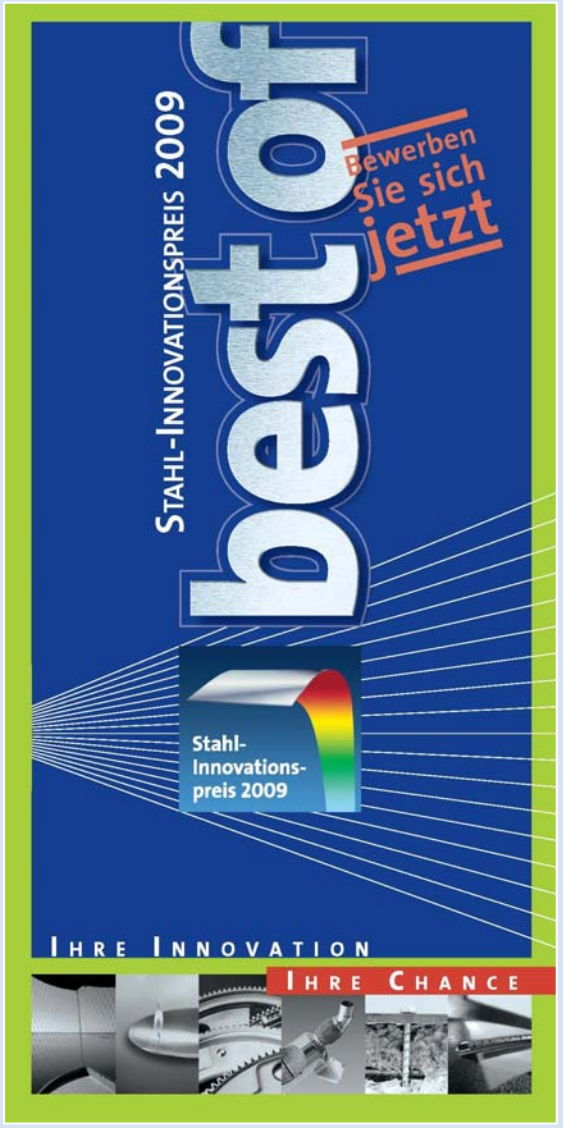
Awarding Ceremony:
30 June 2009
Maritim Hotel, Düsseldorf

Categories

- Steel Products
- Steel in Research and Development
- Steel Building Elements and Systems
- Steel Design

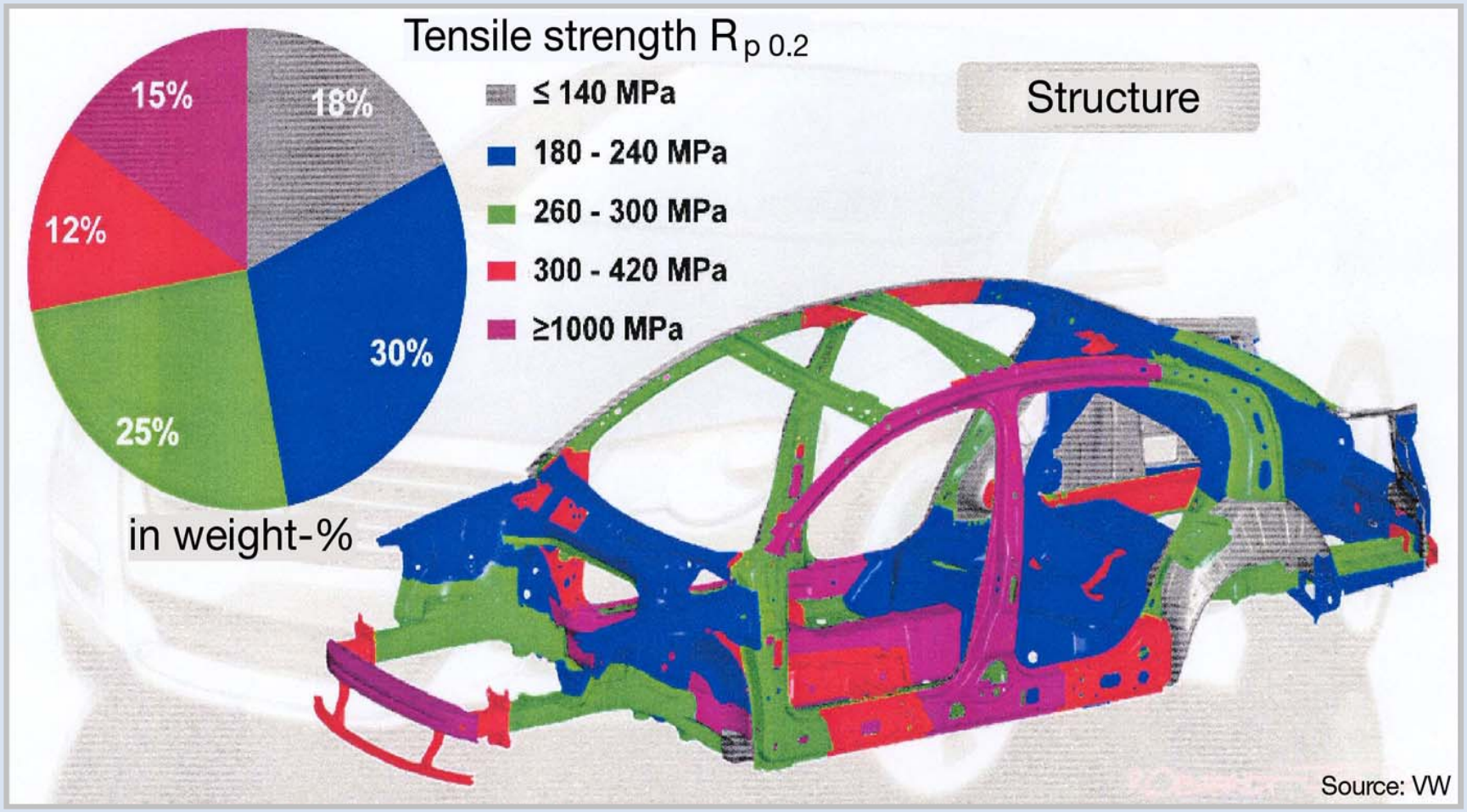
- Special Award:

  Climate Protection with Steel



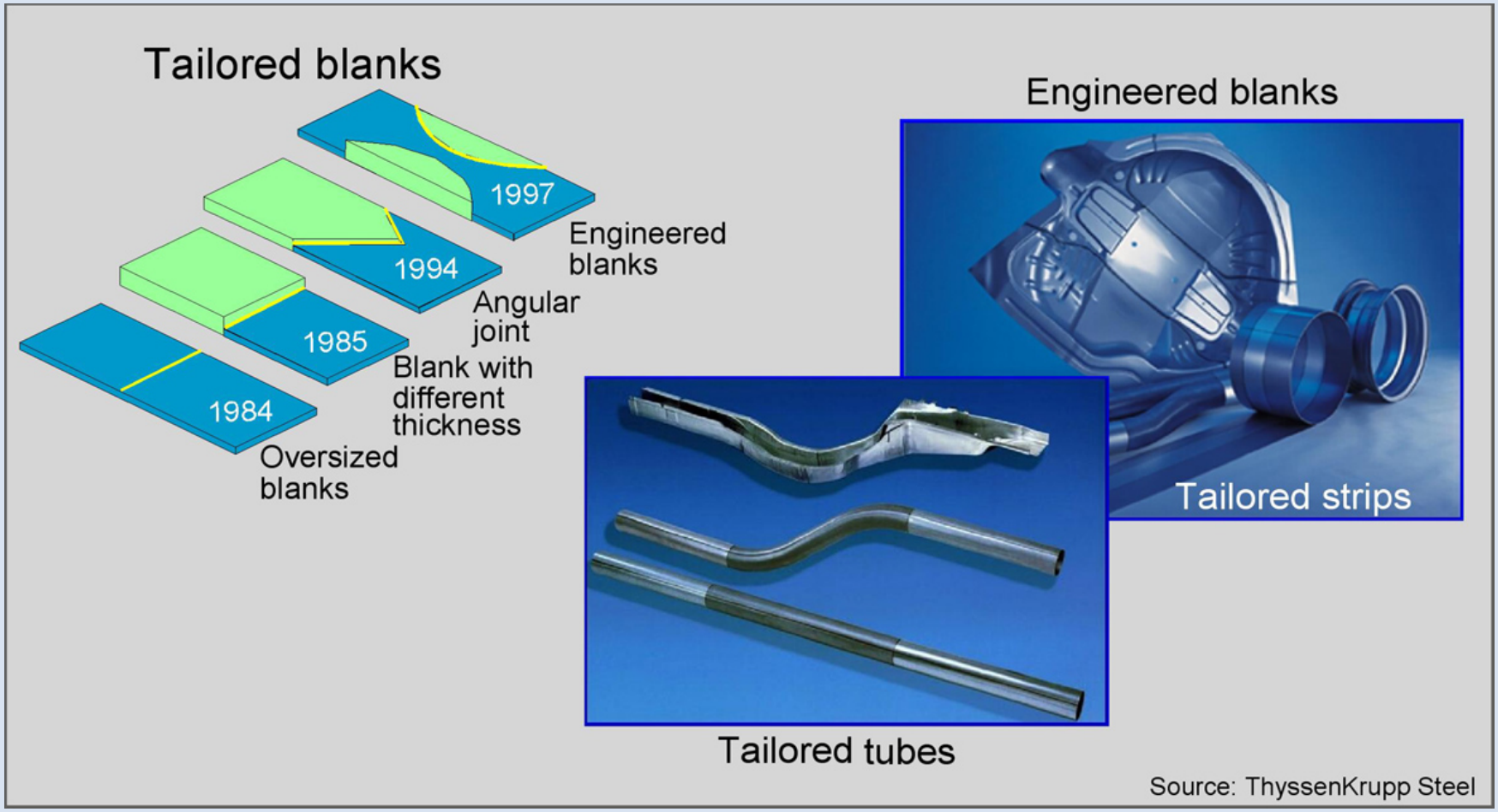
Steel Innovations in Cars: The New VW Passat is Leading

Load optimised use of steel (grades)

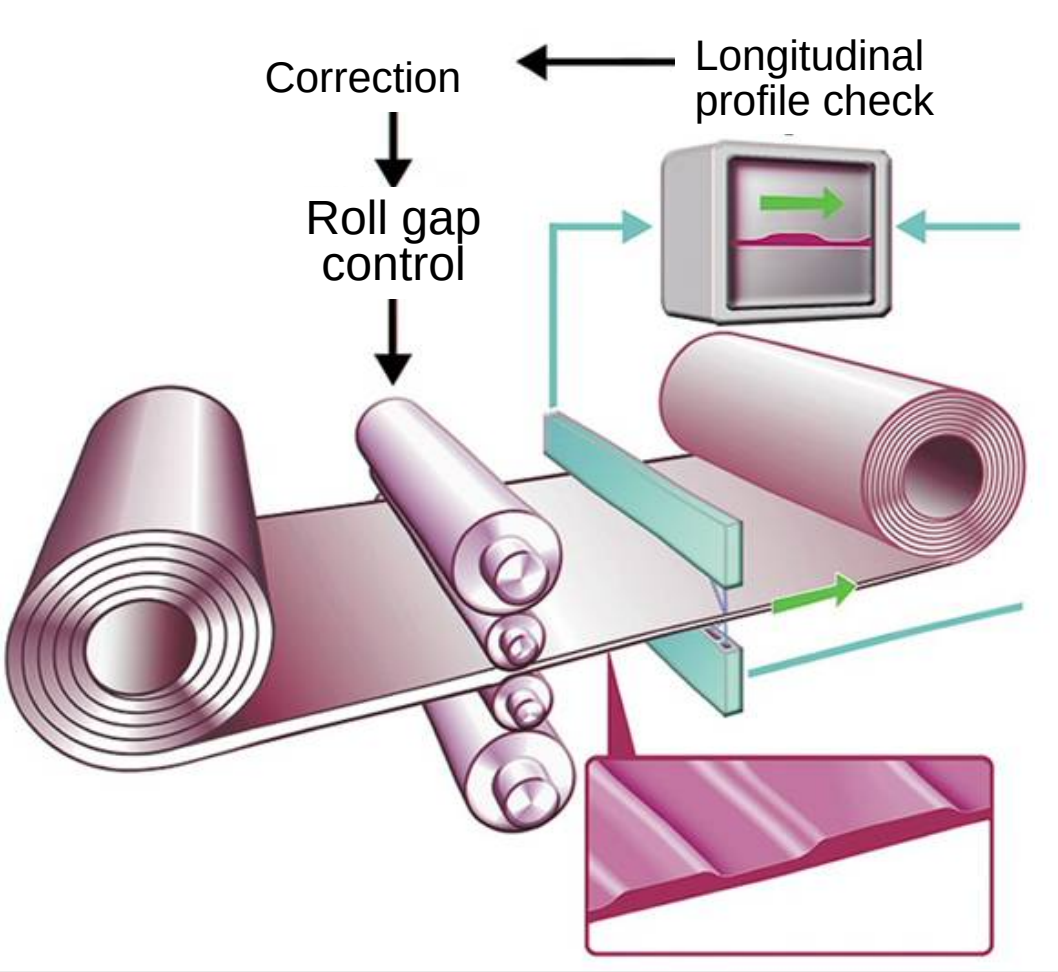


Product Innovations:

Lightweight construction by use of modern semi-finished material – Tailored Welded Products



Principle of Flexible Rolling



- Saving of reinforcement pieces
- Saving of costs because of coil to coil series production
- Lightweigt construction potential up to 40 %
- Optimization of crash properties
- No notch effects

Source: Mubea

Examples of Applications for Tailored Rolled Products

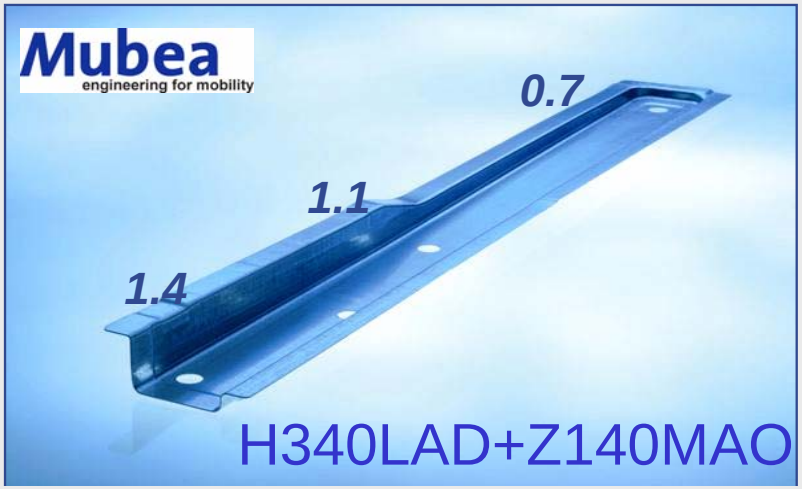
DC E-Class BR 211
Connection carrier

- Improved crash properties
- Weight reduction of 11 % in comparison to a Tailored Welded Blank

Tailored rolled: 1.15 mm to 0.8 mm

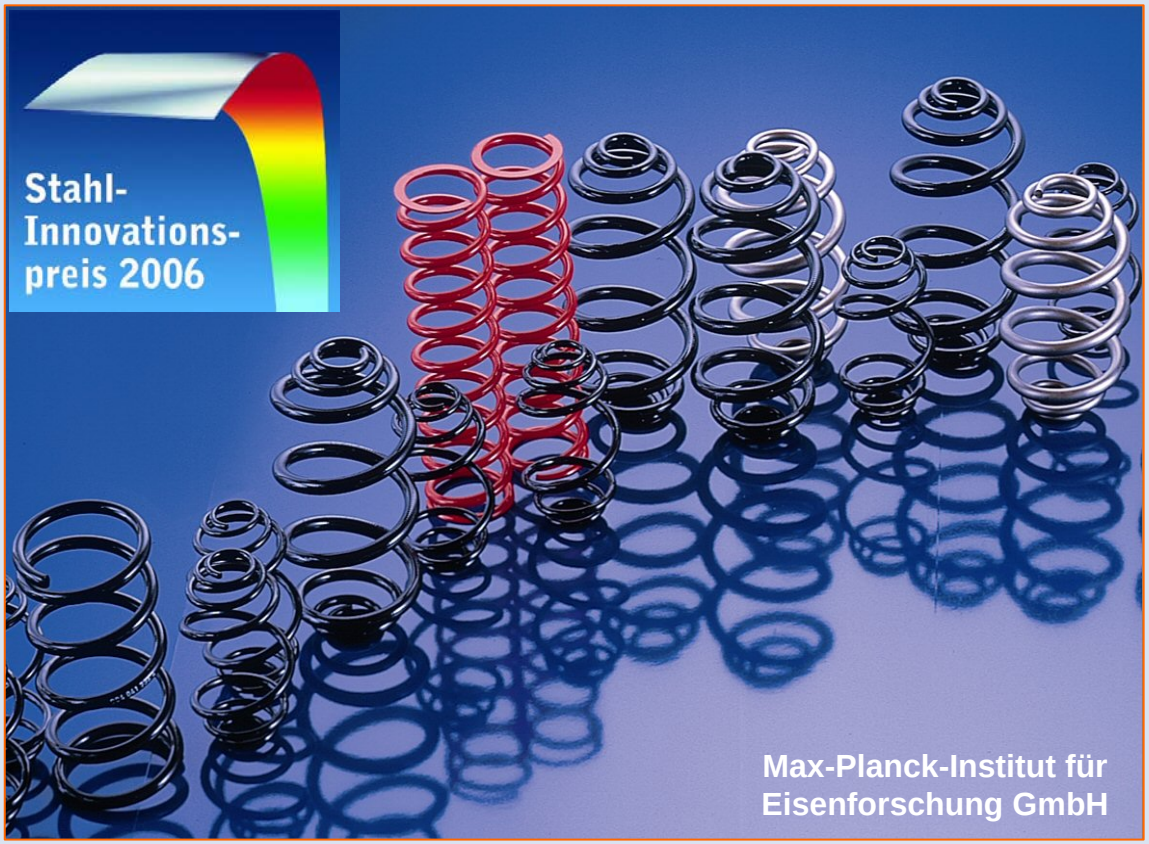
AUDI C6
Side member II

- Weight advantage of 29 %



Tailored rolled: 1.4 to1.1mm to 0.7 mm

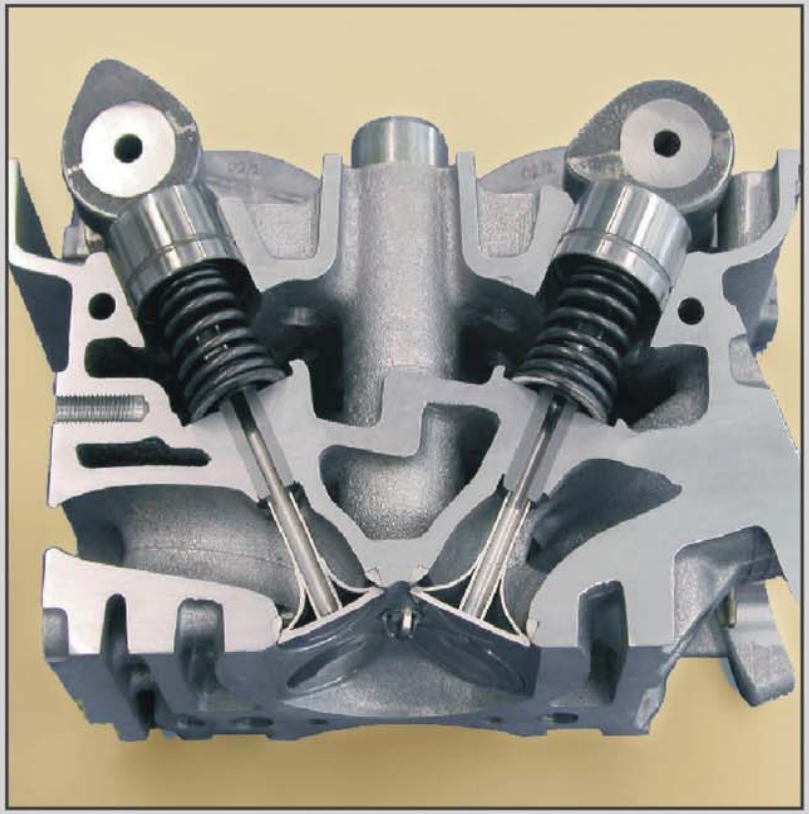
High strength steel for road vehicle helical springs

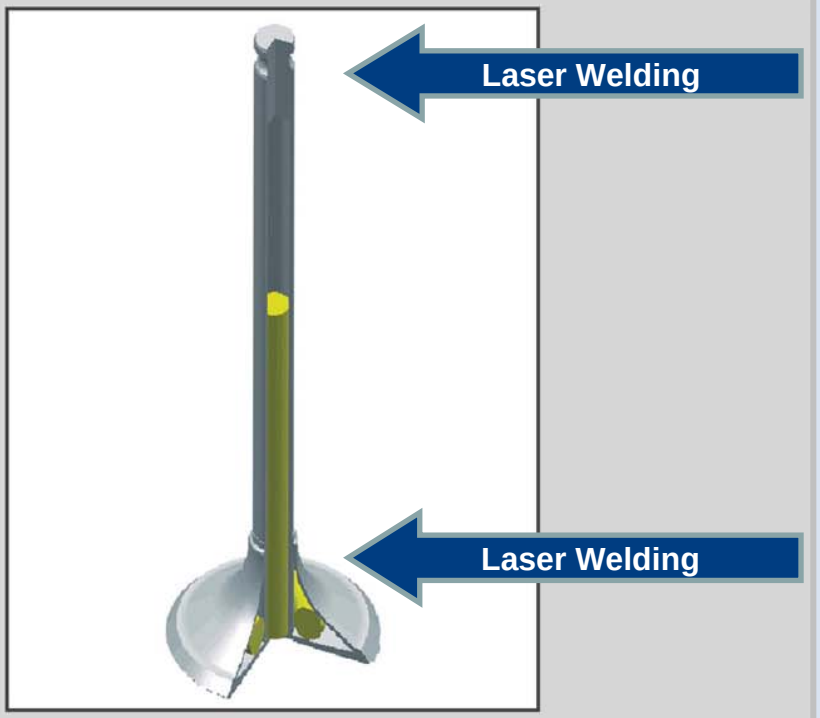


Two-stage thermomechanical process for manufacturing of more compact and light weight road vehicle helical springs

Steel Product Innovation (Award 2003)
Leightweight Valve for Combustion Engines

Laser welded hollow valve, saving 50 % weight,
reducing moved masses and friction losses





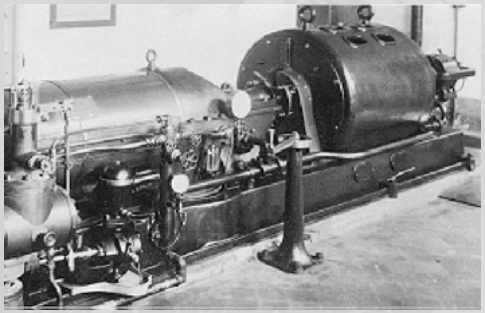
MAHLE Ventiltrieb GmbH
Stuttgart

Machined forged parts

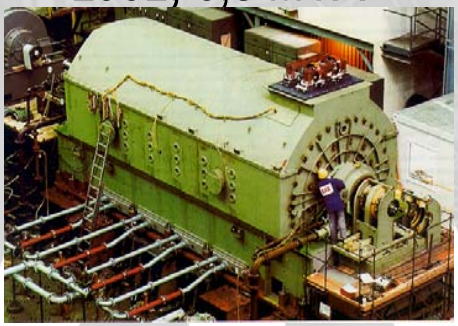
Up-to-date cutting tool for machining of ductile and high strength steels

Electrical Steel as a Contribution to Increase Efficiency in Electric Systems

Turbo generator; Power



1901; 0,3 MVA



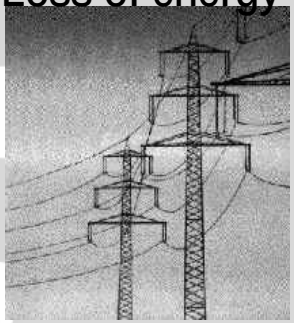
Today; up to 1700 MVA

Transformer 20 kVA; Weight

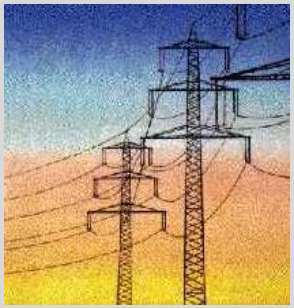
1935; 267 kg

Today; 40 kg

Energy transfer and distribution; Loss of energy



1951; 25 %



Today; 3-9 %

Refrigerator; monthly energy consumpt. per 100 l Volume

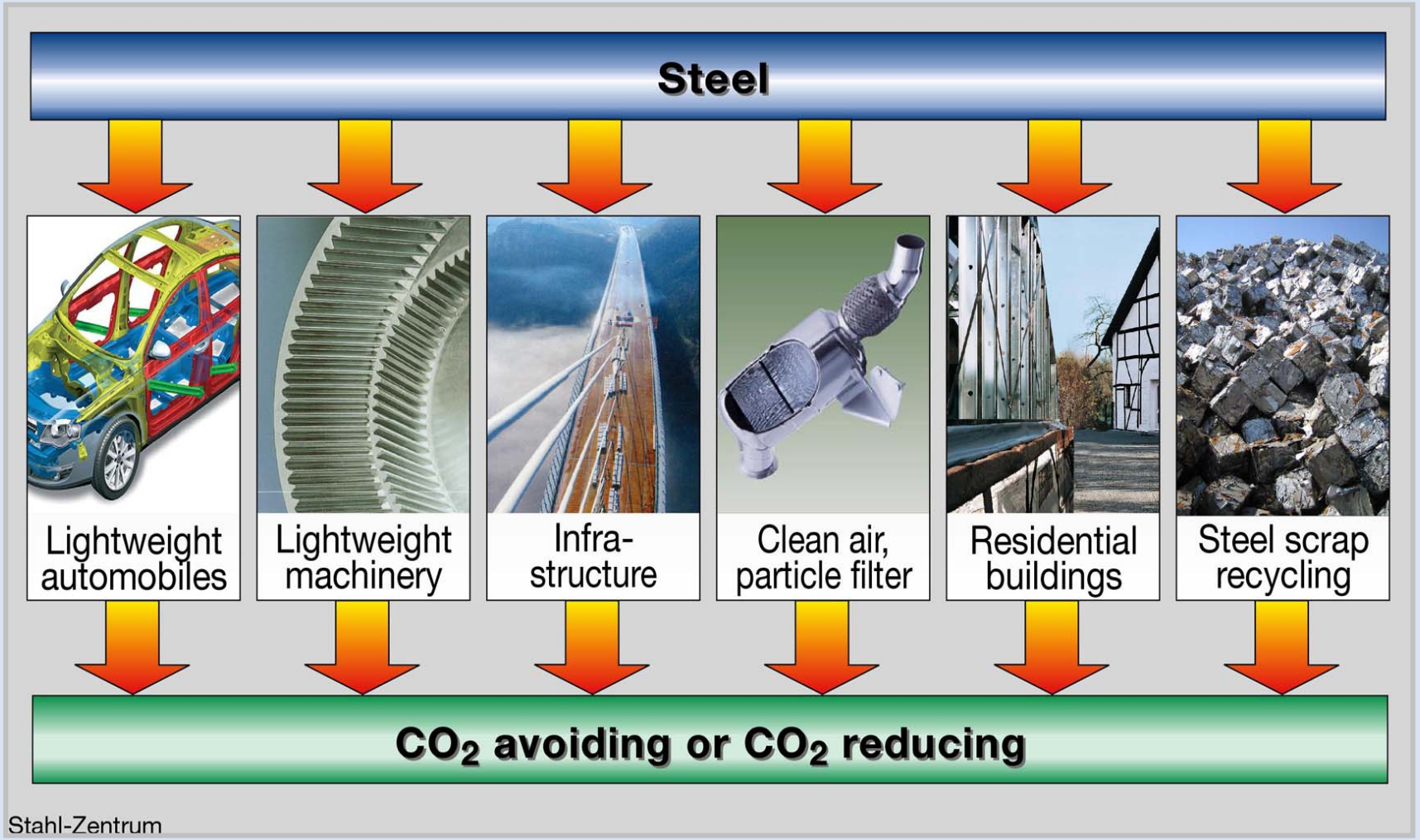
1976; 49 kWh

Today; 14 kWh

Source: ThyssenKrupp; STEEL TODAY & TOMORROW, No. 158 (March 2002)

Climate Change – Steel is the best Choice

Steel – driver of innovations to increase efficiency of resources




The new Blast Furnace # 8 of ThyssenKrupp Steel. Start of production: December 2007
Thank you for your attention!
www.stahl-online.de